VOL. XXIII NEW YORK—THURSDAY, NOVEMBER 10, 1910—CHICAGO No. 19

THE AUTOMOBILE

Great Races at Atlanta

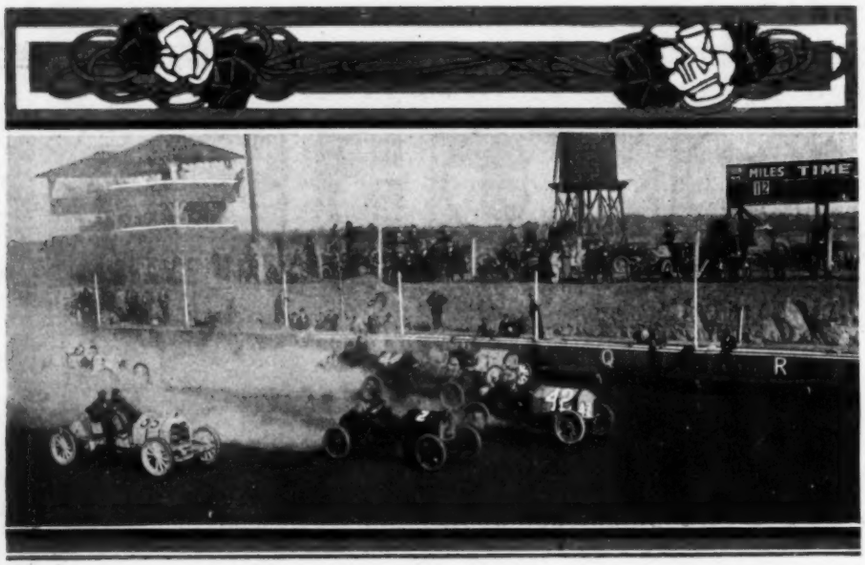
THREE FEATURE EVENTS SUPPLY TRIO OF FINISHES NEVER EXCELLED IN CLOSENESS AND ABSORBING INTEREST IN HISTORY OF TRACK SPORT

MARMON FINISHING IN FRONT IN ATLANTA TROPHY RACE

ATLANTA, GA., Nov. 7—When the checkered flag dipped for the last time this afternoon, the greatest race meeting ever held on the Atlanta Speedway came to a close. It was a complete success in every particular, even the financial end coming out neat or better. From the sporting and utilitarian viewpoints the three days of racing could hardly be improved upon. The simon-pure stock car again demonstrated its improvement in a dozen hard driven contests, while the speedy special machines showed brilliant flights and spectacular finishes.

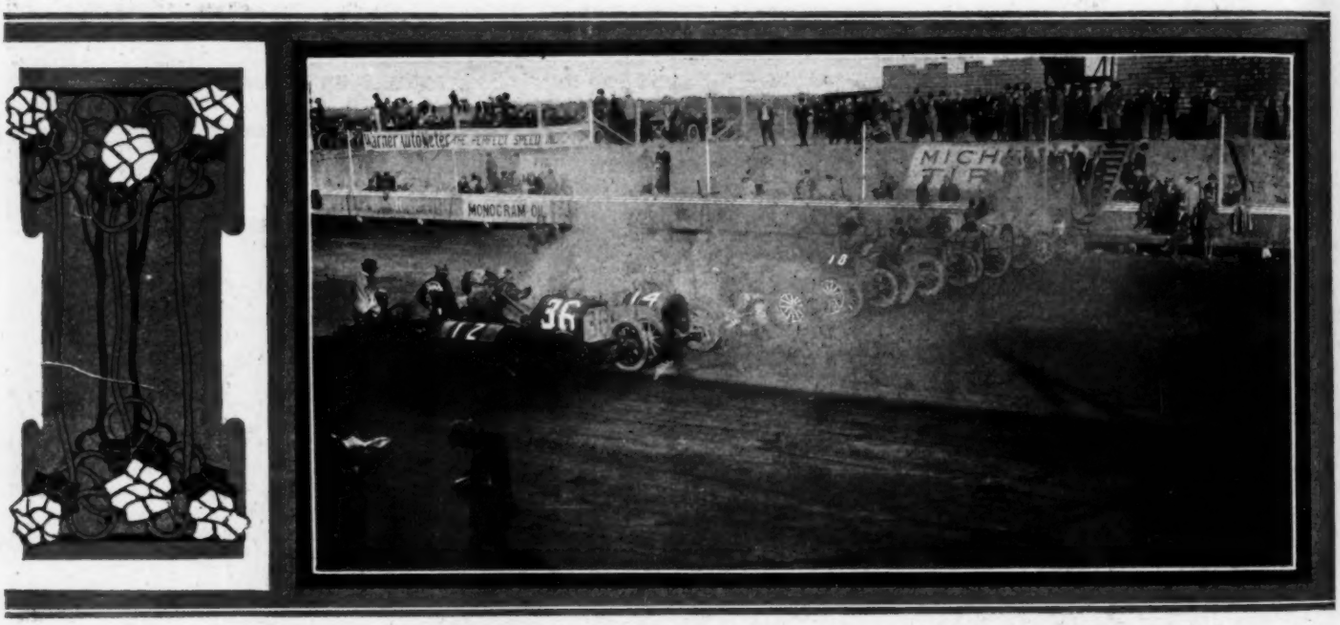
The program was so arranged as to give a big special event each day. The Coca-Cola Trophy race on Thursday at 100 miles was won in a stunning finish by a Falcar driven by Gelnaw. On Friday, the Atlanta Trophy race, 200 miles, was won in a neck and neck driven by a Marmon, piloted by Dawson, which finished 3 1-5 seconds ahead of a Lozier, driven by Mulford. On Monday the Speedway Trophy at 250 miles was captured by a Lozier with Horan at the wheel, with a Marquette-Buick (Burman) in second place.

These races were sharply contested from the drop of the flag



Stoddard leading Fiat, Buick, Simplex, Stearns and Lozier in Free-for-All

and proved wildly exciting to the spectators. The Coca-Cola race set a new mark for thrills. A Marmon driven by Dawson set the pace from the start and after making 49 rounds, or 98 miles, was over six minutes ahead of the Falcar (Gelnaw), which had been driven to the limit to keep pace with the Westcott (Knight), up to that stage of the race. The Marmon coasted down to the pits and stopped as the driver leaped out and feverishly went to work to discover the extent of the injury to his car. It proved to be the drive shaft that had twisted off at the right end of the rear axle where it carried a flange. The driver managed to replace the broken part and got started before the finish of the race, but in the meantime the Falcar had closed the gap and was well around the course on the last



Falcar, Simplex, Falcar, Lozier pair, Cole, Marmon pair, McFarlan and Pope-Hartford

With stilled engines and bared heads during Livingston's dirge in center with Marmon contender at left

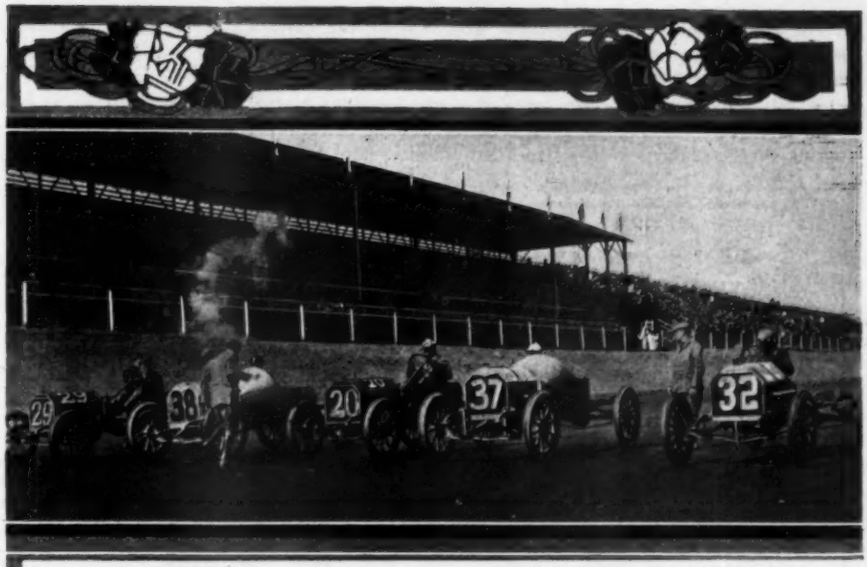
Winning Falcar

round. Driven desperately the Marmon was unable to make up the ground lost and the Fal crossed the tape in front. The Westcott was second, fifteen seconds back, while the Marmon squeezed in third, despite the misfortune.

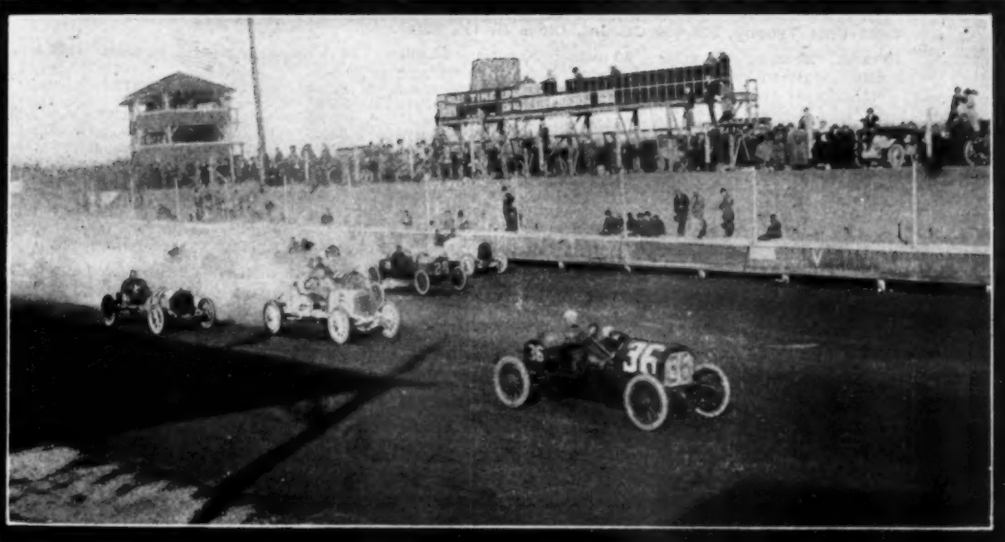
The Atlanta Trophy on Friday furnished another degree of superlative sport when the Marmon nosed out a Lozier after a drive that lasted from the starting gun to the magpie flag. From one end of the race to the other these cars were never more than two minutes apart and for dozens of laps, they lay alongside of one another, taking the turns wide open and shooting down the long straightaways at a terrific rate of speed. The steady Lozier, driven by Mulford cut out a fast pace in the early stages and at one time had established a lead of 80

seconds. This margin was gradually absorbed by the yellow car under the handling of Dawson, and when they came down the stretch locked together like a team, the crowd yelled with redoubled enthusiasm.

Successive tire changes caused the lead to alternate many times during the last quarter of the race, and at 170 miles the Lozier was leading by one second. Nine laps from home the Marmon pulled off the sensation of the contest when Dawson caught and passed his rival in front of the grandstand, leading by half a car length. For eight laps the yellow and white cars were practically neck and neck, but in the final round the Marmon inch by inch opened up a gap of several lengths. The right front tire of the Lozier lost its tread and the car gave a perilous slide near the finish,



Abbott-Detroit and Firestone pairs and E-M-F in Event 9



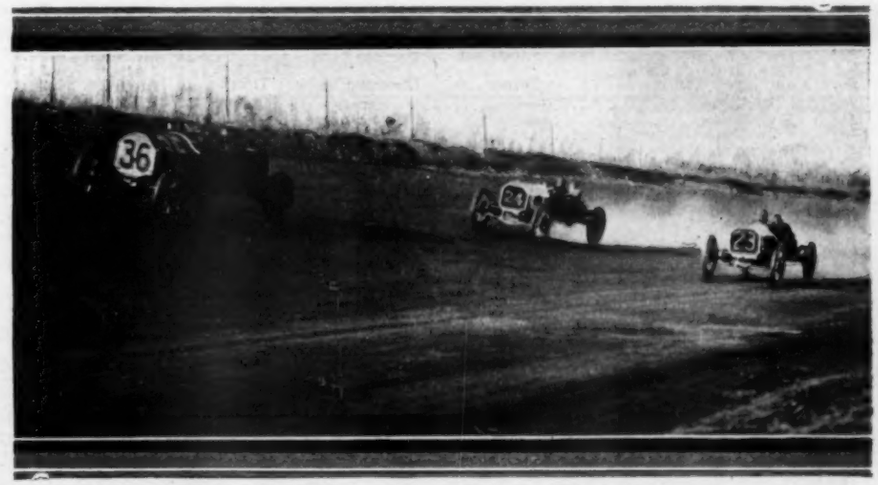
Simplex, Lozier, Falcar, Marmon and McFarlan at start of Atlanta Trophy

but the race was so close that Mulford would not stop. The Marmon continued to draw away, and at the end was about 50 yards to the good.

The free-for-all at 250 miles for the Speedway Trophy was the feature of the Monday's card. A six-cylinder Lozier, driven by Horan proved the winner in the exceedingly fast time of 3:26:15. A Marmon (Harroun) set the pace for fifty laps and looked all over a winner at ninety laps. A cracked cylinder stopped Dawson's car and a sheered pin on the magneto shaft of Harroun's, put that car out of the running also.

Marquette-Buick, driven by Burman, proved the contender at the end. Nine tire changes tell the story as far as the Buick was concerned.

The winner went to the front when the skyrocketing had subsided and



Simplex and McFarlan pair turning out of the back stretch

won a gallant race rather handily. The rest of the card was abandoned on account of the lateness of the hour of finishing the grand prize.

An attractive card of class races was presented each day in addition to the feature events and their running proved to be stirringly spectacular. Not an accident of any moment marred the pleasure of the meeting although a number of cars plunged through fences and one went over the bank.

Rain intervened Saturday and prevented the carrying out of the program as originally planned, the card for that day being carried over until to-day. Naturally this hurt the attendance to some degree. The summary:

FIRST DAY

161-230 Cu. In., Class B, 12 Miles

No.	Car	2 Miles	4 Miles	6 Miles	8 Miles	10 Miles	12 Miles
32	E. M. F.	2:10	3:53	5:41	7:30	9:17	11:05
37	Abbott-Detroit	2:03	3:54	5:41	7:30	9:19	11:09
38	Abbott-Detroit	2:10	4:06	6:02	7:58	9:57	11:57
1	E. M. F.	2:05	4:04	6:05	8:07	10:30	12:15
39	Abbott-Detroit	2:24	4:35	6:45	8:54	11:04	....
30	Chalmers	2:53	5:27	7:59	10:31	....	....
20	Firestone	2:15	4:12	....	....	....	....

231-300 Cu. In., Class B, 10 Miles

No.	Car	2 Miles	4 Miles	6 Miles	8 Miles	10 Miles
25	Marmon	1:55	3:36	5:16	6:55	8:34.7
45	Marmon	1:55	3:36	5:17	6:57	8:39.4
12	Falcar	1:56	3:37	5:18	6:59	8:43.6
27	Falcar	2:05	3:58	5:49	7:40	9:32.4
14	Falcar	2:17	4:14	6:12	8:04	9:57.4
33	Parry	2:11	4:10	6:08	8:05	10:02.6

451-600 Cu. In., Class B, 20 Miles

No.	Car	Driver	4 Miles	8 Miles	12 Miles	16 Miles	20 Miles
5	Lozier	Mulford	3:24	6:34	9:45	12:58	16:13.00
16	Lozier	Horan	3:29	6:44	9:57	13:14	16:32
36	Simplex	Beardsley	3:26	6:40	9:56	13:17	16:36.4
17	Pope-Hartford	Basle	3:29	6:44	9:57	13:16	16:36.7

Southern Amateur Championship, 4 Miles

No.	Car	2 Miles	4 Miles
44	Simplex	1:40	3:20
3	Fiat	1:57	4:58

Free-for-All, 10 Miles

No.	Car	Driver	2 Miles	4 Miles	6 Miles	8 Miles	10 Miles
40	Marquette-Buick	Burman	1:50	3:16	4:43	6:11	7:42
44	Simplex	Matson	1:45	3:20	4:54	6:27	8:04
2	Fiat	Bragg	1:41	3:12	4:43	6:20	8:20
17	Pope-Hartford	Basle	1:54	3:31	5:08	6:45	8:24
35	Stearns	Rutherford	1:51	3:33	5:16	6:58	8:40

Free-for-All, 20 Miles

No.	Car	2 Miles	4 Miles	6 Miles	8 Miles	10 Miles	14 Miles	16 Miles	18 Miles	20 Miles
21	Marmon	1:42	3:14	4:45	6:15	7:46	10:49	12:21	13:54	15:27
44	Simplex	1:44	3:19	4:54	6:28	8:02	11:11	12:46	14:20	15:53
5	Lozier	1:50	3:24	4:59	6:33	8:07	11:18	12:54	14:30	16:07
6	Lozier	1:56	3:33	5:14	6:53	8:30	11:45	13:24	15:02	16:39
17	Pope-Hartford	1:56	3:35	5:14	6:33	8:32	11:49	13:26	15:06	16:41
35	Stearns	1:51	3:32	5:14	6:54	8:35	12:01	13:43	15:26	17:08
2	Fiat	1:42	3:17	4:50	6:23	7:55	11:03	13:03	Blew gasket.	
22	Pope-Hartford	2:10	3:49	6:11	Broke valve and piston					
40	Marquette-Buick	1:38	3:15	Demountable rim came loose.						
42	Stoddard-Dayton	1:53	Broke valve and piston.							

Coca-Cola Trophy, 301-450 Cu. In., Class B, 100 Miles.

No.	Car	Driver	10 miles	20 miles	30 miles	40 miles	50 miles	60 miles	70 miles	80 miles	90 miles	100 miles
12	F. A. L.	Gelnau	8:56	17:40	26:23	35:01	43:36	52:12	60:46	69:19	77:48	86:17.6
26	Wescott	Knight	8:57	17:41	26:23	35:02	43:36	52:13	60:46	69:19	77:48	86:32.1
28	Marmon	Dawson	8:09	16:01	22:57	31:54	39:47	47:47	55:43	63:45	72:01	87:27.3
17	Pope-Hartford	Basle	8:23	16:33	24:54	33:24	41:53	50:31	61:46	70:41	79:23	90:07
27	F. A. L.	Pierce	9:47	19:05	28:24	37:49	47:13	56:35	65:53	75:11	84:30	93:47
24	McFarlan	Adams	10:31	20:28	30:20	40:16	50:00	59:45	69:30	79:17	89:06	98:51
23	McFarlan	Kepler	10:41	20:42	30:49	40:52	50:50	60:44	70:39	80:34	90:39	100:34
14	F. A. L.	Hughes	9:37	18:53	27:59	36:56	45:54	54:52	63:46	72:44	Broken shaft in gearset	
11	Marmon	Heineman	8:22	16:24	24:31	32:46	40:57	49:08	Burned out connecting rod bearing			

SECOND DAY

161-230 Cu. In., Class B, 10 Miles

No.	Car	Driver	2 Miles	4 Miles	6 Miles	8 Miles	10 Miles
32	E. M. F.	Witt	2:1	3:49	5:36	7:23	9:12
37	Abbott-Detroit	M. Roberts	2:5	3:54	5:48	7:31	9:18
20	F'stone-Columbus	McKinstry	2:8	3:56	5:48	7:31	9:19
38	Abbott-Detroit	M. Roberts	2:19	4:16	6:12	8:7	10:4
29	F'stone-Columbus	Frayer	2:5	4:2	5:58	8:9	Did not finish

Free-for-All, Class D, 20 Miles

No.	Car	Driver	4 Miles	8 Miles	12 Miles	16 Miles	20 Miles
40	Buick	Burman	3:4	5:58	8:56	12:6	15:18
2	Fiat	Bragg	3:6	6:6	9:23	12:33	15:49
42	Stod.-Dayton	Harding	3:19	6:27	9:35	12:40	15:51
17	Pope-Hartford	Basle	3:29	6:44	9:59	13:16	16:34
35	Stearns	Rutherford	3:36	7:4	10:31	13:59	17:27

301-450 Cu. In., Class B, 14 Miles

No.	Car	Driver	2	4	6	8	10	12	14
11	Marmon	Harroun	1:51	3:29	5:7	6:43	8:18	9:55	11:31
28	Marmon	Dawson	1:54	3:30	5:4	6:43	8:16	9:50	11:30
17	Pope-Hartford	Basle	1:54	3:30	5:6	6:43	8:19	9:55	11:32
43	Parry	Phillips	2:10	3:52	5:35	7:17	8:58	10:40	12:23

10 Mile Handicap

No.	Car	Driver	Handicap	Time
23	McFarlan	Clemons	Scratch	9:58
24	McFarlan	Adams	3:6	10:33
42	Stoddard-Dayton	Harding	2:36	10:34
17	Pope-Hartford	Basle	2:09	10:36
32	E. M. F.	Witt	1:24	10:39
35	Stearns	Rutherford	2:06	10:45
37	Abbott-Detroit	Montague Roberts	1:22	10:52
43	Firestone-Columbus	Frayer	1:43	

Amateur Free-for-All, 10 Miles

No.	Car	Driver	2 Miles	4 Miles	6 Miles	8 Miles	10 Mile
3	Fiat	Stoddard	1:47	3:16	4:46	6:16	7:46.6
44	Simplex	Heitemeyer	1:43	3:14	4:46	6:17	7:48.7
35	Stearns	Rutherford	1:57	3:42	5:28	7:15	9:04.1

Free-for-All, Class D, 10 Miles

No.	Car	Driver	2 miles	4 miles	6 miles	8 miles	10 miles
40	Buick	Burman	1:37	3:3	4:29	5:55	7:23.55
2	Fiat	Bragg	1:37	3:5	4:31	6:1	7:30.30
42	Stod.-Dayton	Harding	1:48	3:22	4:57	6:31	8:5.32
17	Pope-Hartford	Basle	1:54	3:31	5:08	6:44	8:23.95
22	Pope-Hartford	Disbrow	1:54	Broke rear axle housing			

231-300 Cu. In., Class B, 12 Miles

No.	Car	Driver	2 miles	4 miles	6 miles	8 miles	10 miles	12 miles
25	Marmon	Dawson	1:57	3:36	5:15	6:55	8:35	10:15.5
45	Marmon	Heinemann	1:54	3:34	5:14	6:54	8:35	10:15.7
14	Falcar	Hughes	2:1	3:50	5:40	7:32	9:22	11:15
24	McFarlan	Adams	2:9	4:5	6:00	7:54	9:48	11:43
23	McFarlan	Clemons	2:15	4:14	6:12	8:10	10:7	12:4
33	Parry	Phillips	2:16	4:16	6:15	8:14	10:10	12:5

Atlanta Trophy, Class B, 451-600 Cu. In., 200 Miles

No.	Car	40 M.	80 M.	120 M.	160 M.	200 M.
28	Marmon	34:17	67:31	106:06	139:40	171:12:72
5	Lozier	34:05	66:07	106:58	139:39	171:16:30
6	Lozier	34:15	68:43	110:08	143:26	177:32:50
12	Falcar	37:16	79:00	114:07	149:44	187:58
14	Falcar	38:50	81:56	117:39	153:19	189:46
36	Simplex	34:41	81:30	114:04	160:30	Running
23	McFarlan	39:56	84:42	122:28	160:42	Running
18	Cole	40:05	87:43			
11	Marmon	34:58	Stopped at 60 miles (time 52:54)			
24	McFarlan	39:56				
17	Pope Hartford	Time for 20 miles, 18:39				

THIRD DAY

Speedway Grand Prize, Free-for-All, 250 Miles

No.	Car	Driver	20 Miles	40 Miles	60 Miles	80 Miles	100 Miles	120 Miles	140 Miles	160 Miles	180 Miles	200 Miles	220 Miles	240 Miles	250 Miles
6	Lozier	Horan	16:12	32:09	49:01	66:16	82:25	98:14	114:52	132:55	148:57	165:01	181:06	198:05	206:15
40	Buick	Burman	15:47	33:59	50:57	67:33	82:51	99:16	115:14	130:52	149:59	167:11	182:45	199:58	207:21
44	Simplex	Matson	16:13	32:02	49:46	66:03	82:15	99:51	117:51	134:16	150:39	168:38	185:03	201:08	209:09
36	Simplex	Beardsley	16:38	33:07	50:18	66:58	84:15	101:00	118:27	135:38	154:49	172:06	189:11	208:40	217:20
5	Lozier	Mulford	48:57	65:54	81:53	97:24	115:40	131:20	146:59	163:58	179:34	196:08	211:45	227:38	235:45
24	McFarlan	Adams	19:08	37:46	56:16	74:47	92:59	111:53	130:20	149:08	168:03	187:11	208:21	229:46	241:08
34	Halladay	Harrell	20:15	40:59	61:51	82:52	104:10	122:24	142:52	162:47	182:30	202:04	221:41	241:37	251:22
43	Firestone-Columbus	McKinstry	20:56	38:51	57:01	75:42	96:13	132:14	151:42	196:47	217:35	239:17	Out 208th mile water blew		
26	Wescott	Knight	17:16	34:15	51:07	80:14	104:02	120:34	137:28	165:38	195:24	221:17	Out 208th mi. val. &wat. gas.		
21	Marmon	Harroun	15:35	31:24	47:40	63:58	80:11	96:21	113:57	129:41	152:18	Sheered pin magneto shaft.			
28	Marmon	Dawson	16:12	32:09	48:12	64:29	80:42	96:35	113:00	133:19	160:45	Out 184th mi. cracked cyl. wat. jacket			
3	Fiat	Stoddard	17:08	38:14	56:00	Out 76th mile broke steering arm.									
13	Simplex	Church	16:13	37:38	Out 81st mile broke crankshaft.										
17	Pope-Hartford	Basle	Out 2nd mile broken valve stud												
42	Stoddard-Dayton	Harding	Out 14th mile stripped cam gears												
22	Pope-Hartford	Disbrow	Out 10th mile cylinders lifted.												

Ready for the Grand Prix

BIG FIELD OF RACERS PREPARED TO LINE UP IN PREMIER AMERICAN SPEED CONTEST AFTER TWO LIGHT CAR CLASSES ARE RUN OFF

The much-coveted Tiedeman Trophy, which six small cars will compete for

SAVANNAH, GA., Nov. 7—With its lists full the Grand Prize, which is to be run off Saturday over a course which has been officially measured at 17.2 miles in circumference, promises to excel in every way the former running of the event, which took place here in 1908. When midnight struck Saturday, November 5, the entry lists of the race closed with a varied collection of racing automobiles, twenty-three of which have been announced to take part in the big race.

The entries for the race are as follows:

Car	Driver	Car	Driver
Fiat	De Palma	Lozier	Horan
Fiat	Nazzaro	Stoddard-Dayton	Harding
Fiat	Wagner	American	Wallace
Benz	Bruce-Brown	Pope-Hartford	Basle
Benz	Hemery	Pope-Hartford	Disbrow
Benz	Haupt	National	Aitken
Marmon	Dawson	National	Wilcox
Marmon	Harroun	Marquette-Buick	Burman
Roebling-Planche	Roebling	Marquette-Buick	A. Chevrolet
Sharp	Sharp	Marquette-Buick	Not Named
Alco	Grant		
Simplex	Matson		
Lozier	Mulford		

Such a collection is bound to produce a contest and the indications all point to several new records. All the drivers and cars that are to take part in the race are on the ground, with the exception of those engaged in the Atlanta races. Owing to a peculiarity of the Georgia law it is illegal to ship anything by fast freight on Sunday, and as a consequence several of the cars now in Atlanta will not reach the Savannah course until Wednesday, thus allowing the drivers very short time to familiarize themselves with the course.

Despite the fact that the elimination of several curves and detours has shortened the course materially, the Grand Prize race will be the longest ever run in America. Some exceedingly fast time has been reported. One of the Buicks made a round in 14:12; a Benz made a circuit in 13:55; a Fiat in 16:25; the Alco in 16:17 and others turned the course at various speeds.

A. L. McMurtry, chairman of the technical committee of the Automobile Club of America, commenced the examination of the cars to-night.

In the Savannah Challenge Trophy race, which will precede the running of the Grand Prize, nine entries have been received, as follows:

Car	Driver	Car	Driver
Marmon	Dawson	Mercer	Roebling
Marmon	Heinemann	Pullman	Not named
Falcar	Gelnaw	E-M-F	Witt
Falcar	Hughes	E-M-F	Not named
Falcar	Pearce		

These cars will circle the course fifteen times, the winner to receive the handsome cup donated by Savannah and $1,000 in cash besides various accessory prizes. There is a sporting tinge apparent about the Savannah trophy entry list that has appealed to motordom with peculiar force. The Atlanta rivals at the head of the list will have another opportunity to decide as to superiority, while those in the middle and at the end are not disposed to yield a single chance to the others unless forced to do so.

The Tiedeman Trophy for smaller cars which will make ten rounds of the course has attracted a small but select field. The list is as follows:

Car	Driver	Car	Driver
Lancia	Knipper	Maxwell	Costello
Cole	Bill Endicott	Maxwell	Wright
Cole	Harry Endicott	Maxwell	Doorley

The Lancia, which met with accident in the Massapequa Sweepstakes over the Vanderbilt Cup course while well out in front, will endeavor to reverse the verdict in that race, which was won by Bill Endicott's Cole "30." Endicott does not agree that such will be the case, and the Maxwell trio firmly expect to win over both. Thus there is the groundwork for a spirited race, with everybody trying desperately to reach the tape first.

The ancient city of Savannah is filling with visitors. So far there has been little difficulty experienced by anyone in obtaining accommodations, but the near future holds out the promise of cramped quarters for the late arrivals.

The stands are practically completed and will easily accommodate 40,000 spectators, and the course is as perfect as it can be made in the limited time that has been allowed for such work. As the drivers have grown more accustomed to the turns it has been found that only one is really difficult; the others may be taken at nearly 60 miles an hour. The straightaways seem capable of allowing the extreme speed limit of modern automobile construction.

Erecting the grand stand for the Grand Prize race at Savannah

One of the numerous small bridges adding to safety of the course

Opening Alps

The zigzag road through Furka Pass, the Rhone Glacier to the left. Mont Saleve, in the ascent of which the automobile beat the funicular railway

SWITZERLAND, the "Playground of the World," has proved itself during the past season to be wonderfully attractive to the automobilist. In comparison with the attitude of the government and people in other years toward touring parties, the position assumed by State and individual this year has proved welcome in more ways than one.

Only a few years ago cabled reports of barbarities on the part of the peasant folk and the authorities as applied to American motorists were common, but this season the whole proposition has been altered. Where only a few years ago it was unlawful for the motorists to so much as enter some of the cantons, to-day all but one invite the traffic, and in the course of another year the roads of the single outstanding canton will be opened to some extent.

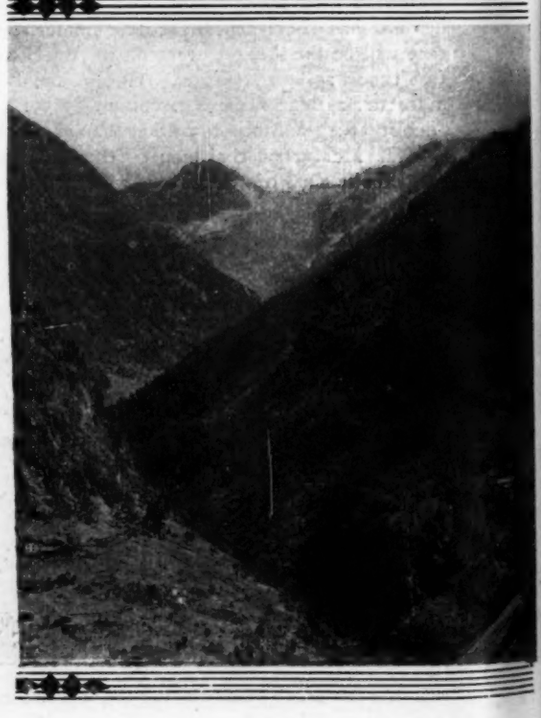
One of the accompanying pictures, which shows a bit of highway between Davos and Filisur, emphasizes the real underlying reason for the hostility of the Swiss peasantry against the automobile in times past and accounts for many of the stringent road rules of the land. As will be seen, the roadway is built out from the wall of a precipitous gorge and is rather narrow as judged by the American standards. The roadbed is delightfully smooth and well kept and on its outside edge a retaining and guard wall has been erected to hold up the road and prevent vehicles from plunging into the chasm below.

This is part of an exceedingly tortuous road, winding along the side of the gorge for many miles. The turns are abrupt and the passing of two swiftly moving vehicles on one of these turns is quite a nice little problem. At the rate of thirty miles an hour such a passing is a desperate gamble at the best and a tragedy at the worst. Consequently, the Swiss countryman decided long ago that the tragedy was unnecessary and ruled out the automobile in a large part of the Republic. Latterly, however, this general adverse legislation has been modified and the present status of affairs has resulted from a better understanding on both sides and some mutual concessions.

The road rules of Switzerland are still detailed and stringent. Speed limits are low and the regulations provide for more detailed protection of life and property than do those of America or of other States of Europe. It cannot be said that the automobile is really popular in any part of rural Switzerland, but it can be said with truth that only in recent years has the motor car been safe in numerous other countries and localities. In fact, to-day it is not quite a pleasure trip to try to cross some of the parishes of lower Louisiana on account of the hostile attitude of a considerable portion of the populace.

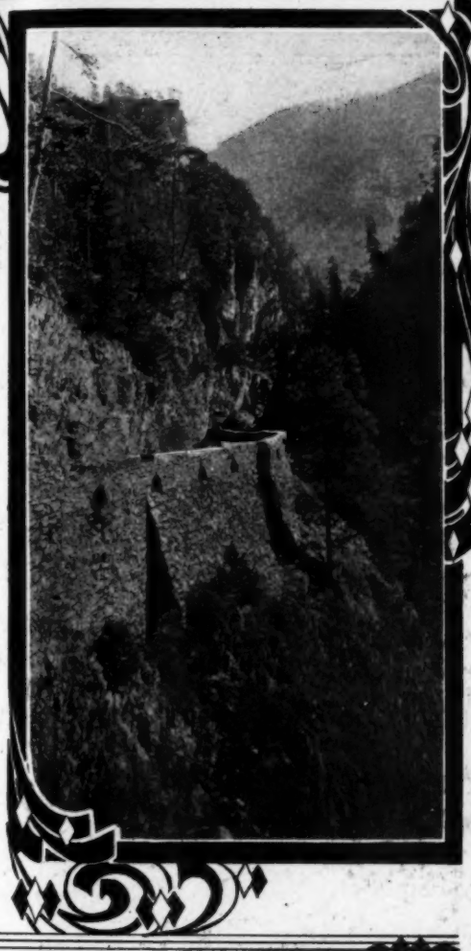
But the Swiss are great respecters of the law, and the law now reads that motoring is not a crime, and consequently if the tourist keeps strictly within the letter and spirit of the law he is safer in the Swiss mountains than he would be in the hands of a pack of Louisiana "Red Bones."

Last year when the Grisons canton was opened up to motor travel there was some popular hostility, which has now subsided in that locality. One of the first motorists to essay any remarkable record breaking in the Grisons district was Dr. Douglas Fawcett, of San Francisco, Cal., and Paris, France, who climbed to the

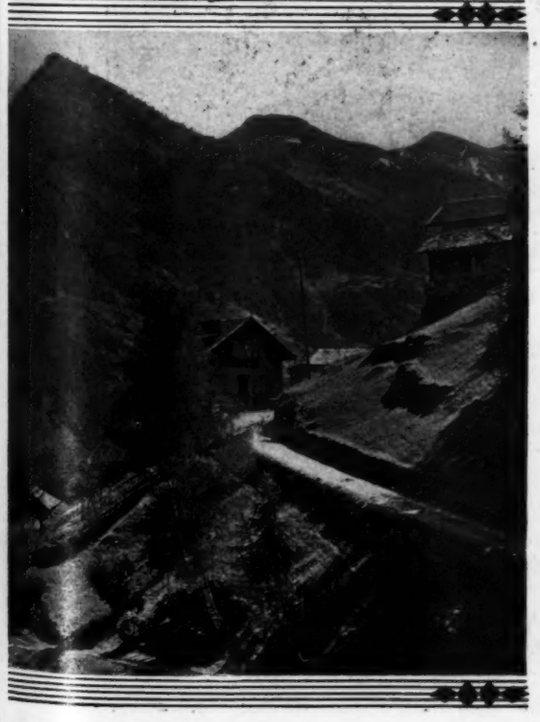


Showing one of the stretches of

To The Auto



Between Davos and Filisur, the road built at great expense
The floor of the Valley of Chamounix between Les Praz and Aiguille du Dru



excellent road en route to Finhaut

top of the Gornergrat Peak in a 50-horsepower automobile. The average gradient of the climb was slightly more than 20 per cent. and spots where the machine had to climb better than 30 per cent. were common enough. The peak of the Gornergrat is shown in one of the accompanying illustrations.

During the past Summer a novel race to the summit of Mont Saleve, shown on this page as a perpendicular bluff of majestic proportions, was run between a small touring car and the funicular railway. Saleve is 4,290 feet high, and prior to this event had never been scaled by an automobile. So dangerous is the mountain regarded to be that the project was discountenanced by the authorities at first. Four men met death on the mountain this year through falls and avalanches, and nobody had any idea that the car would be able to make the ascent.

But when the actual trial was made the automobile went up the grades and reached the summit on low gear and finished a trifle over half an hour ahead of the railway train. The return trip was even more perilous, but with careful driving it was accomplished without accident.

The other pictures show a scene in one of the Swiss valleys; a vivid illustration of a highway midway between the floor of the valley and the heights of the Alps and the third depicts and outlines the marvelous Furka Pass, with the famous Rhone Glacier on the left. Along the road, that seems but a tangled thread in the picture, motor tourists are now enabled to pierce the very heart of the Swiss mountains with all the comfort they might enjoy from a spin along Riverside Drive.

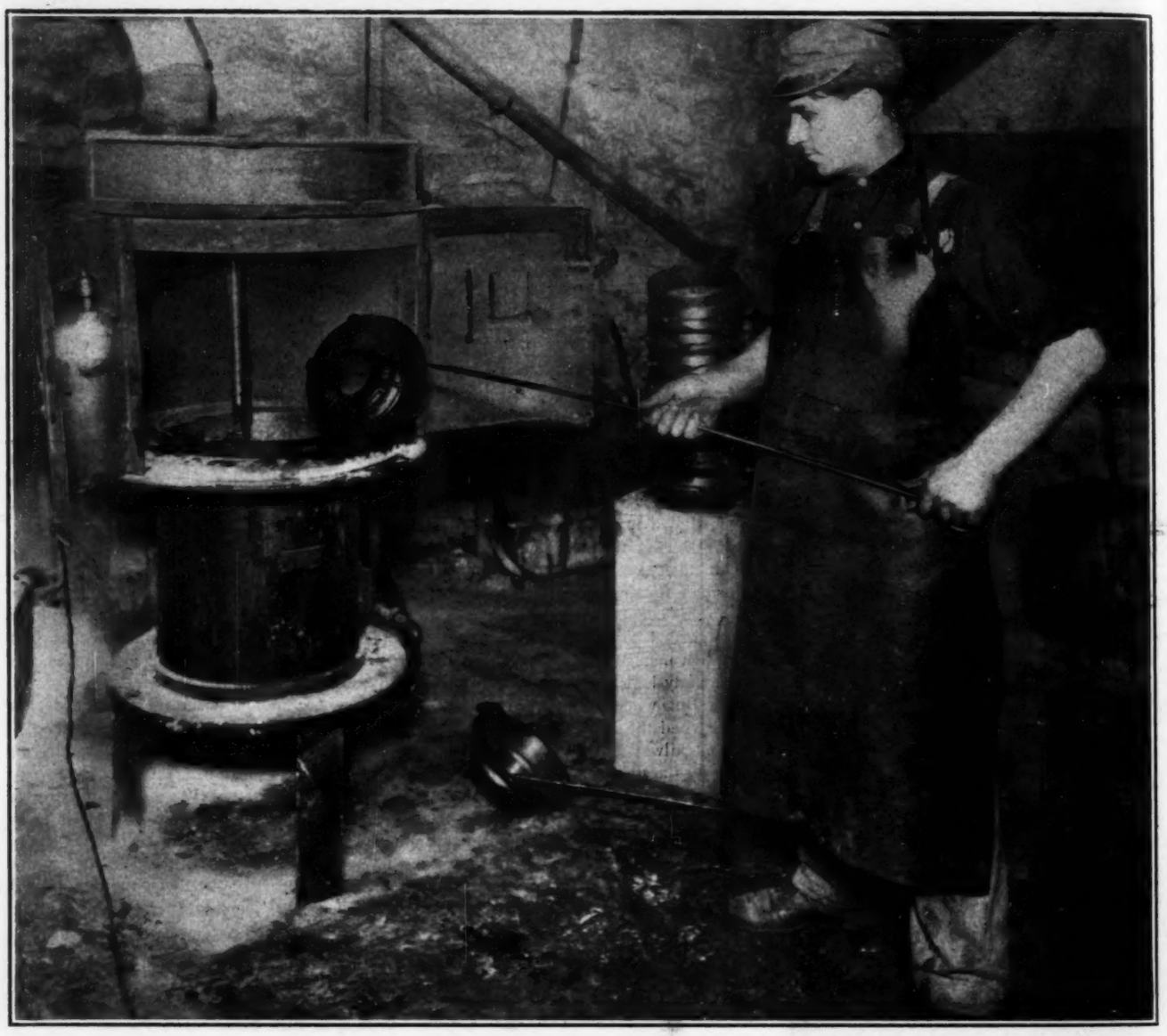
A Strange Case

Just Goes to Show That Men Are Willing to Risk Other Men's Funds

NOW that the automobile has most thoroughly supplanted the horse up to the limit of the ability of makers of automobiles to place them at the disposal of users, those who are charged with the spending of the "ratepayers" fund in England propose to expend a vast sum of money in the breeding of horses for use in the British army. The latest report from "over seas" says that the "service" is to be provided with mounts of a special breed, the money-spenders claiming that the present mounts are mongrels. From a modern point of view, horses in the army should have one value that automobiles cannot lay claim to: should rations run out, the troops may eat the horses. Looking at it from still another angle, it is all they can do, whereas, with automobile transportation, they could go to some place and take what they want by way of food. The great point to be borne in mind is that men seem to have the faculty of making cost if other men pay the score. The point is adequately illustrated in the method that obtains in New York City: if a street is to be torn up for the purpose of putting down sewers, etc., it is first repaved, but no sooner is the new pavement down than the sewer contractor comes along and pulls it up again.

Engineering Section

DEVOTED TO THE DISCUSSION OF ENGINEERING PHASES OF AUTOMOBILING, INCLUDING DESIGNING AND CONSTRUCTION FEATURES OF PRODUCTS, AND INFORMATION TO AUTOISTS



DEPICTING THE METHOD OF HEAT-TREATING STEEL TO BRING OUT KINETIC QUALITIES, USING SALTS OF METALS FOR THE BATH, AT WOOD'S PLANT

THERE is nothing to be said for the manufacturing of automobiles that is of greater importance than the methods that have to be employed in the bringing out of the desired qualities in the parts of kinetic responsibility in cars. The time was when it seemed to be good enough to utilize cold-rolled steel even for jackshafts and such other parts as the automobilist must depend upon in the transmission of the power of the motor to the point of contact of the driving wheels with the ground. It is slowly being felt that cold-rolled steel is subject to fatigue at an alarming rate.

Even the best grades of steel to be rendered fit must be subjected to specific forms of heat-treatment, the desire being to bring out (a) great surface hardness when this property is needed, (b) good surfaces for bearings where plain journals are employed, (c) accentuated shock-withstanding qualities at every point, (d) free cutting characteristics during the manufacturing processes, and (e) good service when the automobiles are placed in the hands of the users.

Some of the older methods are being proven as inadequate, failing utterly to accomplish what their sponsors claimed for them, and the dawn of broad knowledge, which is peeping up over the hill, is indicating the way to better automobiles, requiring a more careful selection of material, taking into account the peculiar demands of the service, and the fact that roads, unlike steel rails, introduce conditions which have to be met in a new way.

Fig. 1 (A)—34 x 4 Continental tire inflated to 35 pounds pressure per square inch showing holes and cuts that need filling

Fig. 1 (B)—34 x 4 Continental tire at 27 pounds pressure per square inch the tread looked good to the naked eye, but in reality was full of small holes

Imprint Method of Testing

TESTING TIRES TO DETERMINE THE AREA OF CONTACT AND THE EXTENT OF DESIRED INFLATION—TESTS MADE AT THE HUDSON GARAGE, NEW YORK

USUALLY the questions of the care of tires are handled without reference to the area of contact of the tread with the ground, but, as a matter of fact, this point leads to a field that is rich in result. In a series of tests that were conducted on a special tire-testing machine, at Chicago, Illinois, under the direction of F. J. Newman, chief engineer and shop manager of the Woods Electric Company, it was found that flexure and its manifestations, as well as the damage done by it, also the power taken in doing this damage, were all represented in the area of contact of the tire with the ground, and it is suggested here that automobilists look into this phase of the subject just a little, it being the case that any one can make the imprints and observe the effect of pressure, also the extent to which the area of contact is altered as the pressure is raised or lowered.

While this form of testing will naturally demand a large amount of investigation ere it will lead to anything very tangible as a general proposition, the fact remains that, under conditions of a single set of tires of a fixed size, on a car of a given weight, so many of the factors are on a fixed basis that the result of observation will lead to good and beneficial results. When an automobilist learns, in this way, just what the area of contact should be, it will be a simple matter for him to make a check imprint occasionally, and, by so doing, find out how the tires are holding out. If the fabric is not stout enough, or if there are other structural changes, all of these conditions will be reflected in the changing area of contact.

At all events it is a good idea for every automobilist to become acquainted with the source of his greatest expense, and by observation learn how to limit cost and obtain a better return for it.

In making imprint tests it will of course be true that the shape of the tread and the thickness of the material employed therein, together with the flexibility thereof, will have a marked bearing upon the area of the imprint, particularly when the tire is new. On this account it will not be possible to make valuable comparisons of the various types of tires, one with the other, and the data, to be of value, must be confined to comparisons involving a given shape and make of tire. Nevertheless, observations along this line, if they are made at reasonably regular periods, measured in miles traveled rather than in time, will have the virtue of showing the rate at which the material of which the treads are made disintegrates, it being the assumption that the initial rigidity of the material is desirable, and that as this rigidity falls away in service, it is a sign that internal work has had its effect upon the molecular relations, nor will it be farfetched to reach the conclusion that changing molecular conditions are but a sign of deterioration. If this contention is not right, and the reverse holds, it is equal to saying that the tires are not good when they are new, and that they improve with age. If there is anything in this phase of the story, every automobilist in the land will be pleased, but experience proves to the contrary. Even if it is difficult to arrive at any definite conclusion from imprint tests and observations, there still remains the advantage that must come if the autoist pays more attention to his tires than is now the case, and certainly investigations along these lines will compel that measure of attention that is bound to result in a more intimate acquaintance with what is a serious problem; but let the intent be to conduct all investigations without trying to foresee how good or bad they are, since knowledge comes with intimacy, and the latter is the child of investigation.

Fig. 2 (A)—34 x 4 Goodrich tire with damaged cut caused by striking the curb, inflated to 80 pounds per square inch

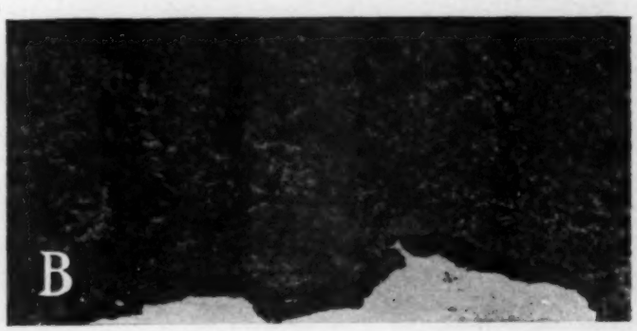
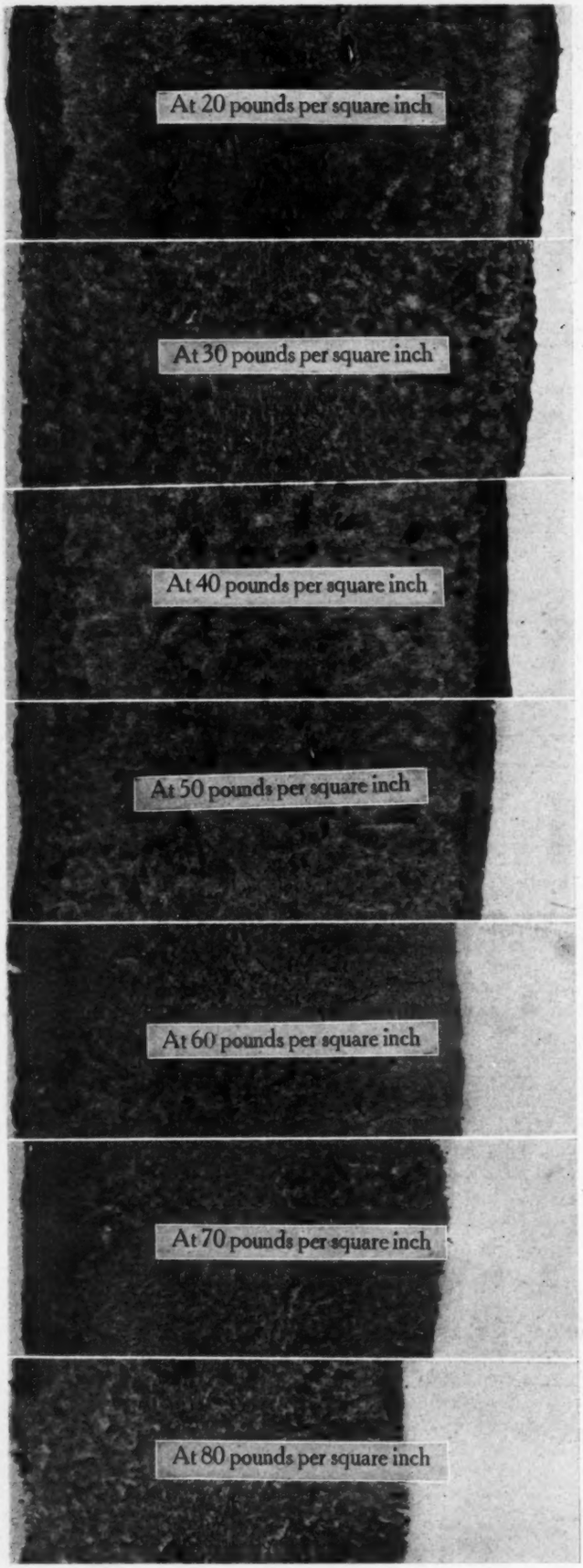


Fig. 2 (B)—The same tire inflated to 40 pounds per square inch


At 20 pounds per square inch
At 30 pounds per square inch
At 40 pounds per square inch
At 50 pounds per square inch
At 60 pounds per square inch
At 70 pounds per square inch
At 80 pounds per square inch

Imprint of a 36 x 4-inch tire under different pressures, showing the width of the tire-contact on the ground for the several pressures

Out of 13 tires recently tested at a public garage for pressure, irrespective of size, but one, 36 x 4 1-2, showed correct pressure, viz., 90 pounds per square inch. Of all the tires tested, the condition of this one was the worst; but the mileage obtained from it was 5,000 miles, and in comparison with those that had run only from 1,000 to 2,000 miles it compared very favorably. There were no signs of deep cuts and the tread was worn evenly, and considering that the car was of 50-horsepower, with a heavy limousine body, it is but fair to the tire to presume its longevity is in great degree due to the proper pressure being maintained.

The two following tables show the amount of flexure of the tires taken promiscuously, as compared with the size of the tire at the top:

TESTS ON REAR WHEEL OF EMPTY SEVEN-PASSENGER, SIX-CYLINDER TOURING CAR FITTED WITH 37 X 5 PLAIN TREAD TIRES

Pressure in pounds per square inch	Measurement of tire on top in inches	Measurement of tire at bottom in inches
105	4 9-16	4 1-16
100	.....	4
90	.....	3 7-8
80	.....	3 13-16
70	.....	3 25-32
60	.....	3 3-4
55	4 1-2	3 3-4
50	.....	3 11-16
40	.....	3 5-8
30	.....	3 7-16
20	.....	3 1-8
14.7	.....	2 13-16

The extreme widths of the tire at the pressure that the tire was found to contain, viz., 55 pounds, measured with a pair of calipers, were as follows: Top, 5 5-16 inches; side, 5 1-4 inches; bottom, 4 3-4 inches.

TESTS ON FRONT AND REAR WHEELS OF LIMOUSINE FITTED WITH 36 X 4 1-2 TIRES

Pressure in pounds per square inch	Front Tire		Rear Tire	
	Top	Bottom	Top	Bottom
90	4 1-16	3 3-8	4 1-16	3 3-8
80	.....	3 1-4	.....	3 5-16
70	.....	3 7-32	.....	3 1-4
60	.....	3 3-16	.....	3 3-16
50	.....	3 1-8	.....	3 1-16
40	.....	.....	.....	2 7-8
30	.....	.....	.....	2 5-8
20	.....	.....	.....	2 3-16
14.7	.....	.....	.....	1 13-16

The extreme width of the tire at the lowest pressure, viz., 14.7 pounds, was: Top, 4 5-8 inches; bottom, 5 15-16 inches.

Storing Tires

If the Car Is Not To Be Used for the Winter Store the Tires

SOME automobilists prefer not to drive in the Winter time, and in order that the car will be in good order when Spring time comes they remove the tires from the wheels, and after washing them, making all necessary repairs, and wrapping them up, put them away in a dark, damp place. Tepid water and castile soap are used for washing; repairing is done in the most careful way, remembering to heal up every little wound so that mildew cannot get at and bite the fabric. The inner tubes are also fixed, and when everything is in shipshape the inner tubes may be put back into the outer casings and slightly inflated to remove all creases, laps and folds, having a care not to employ a pressure of more than just enough for the intended purpose. With the inner tubes stored in the outer casings, the next thing is to wrap the tires in burlap, putting a wrapping of black oilcloth over the outside, and with stout twine binding the wrapping sufficiently to prevent the seams from opening up and letting in the light. The tires, in this shape, may be stored in a reasonably cool, damp cellar, in the darkest place that can be found. Keep well away from the furnace, if there is one in the cellar, but it will not be necessary to fret about the dampness. All tire-makers store rubber in dark, damp vaults, and there is no reason why tires may not have the advantage of this treatment, provided there are no little wounds upon the surfaces such as will expose the fabric, and allow the mildew pest to enter and feed upon the cotton, of which this fungus growth is very fond indeed.

A word while on the subject of testing tires: See that the test gauge fits the thread of the valve and that it clears the brake drum of the rear wheel, as in several cases where tests were being made it was impossible to take the pressures on this account. The gauge fitted to the pump does not give the pressure in the tire, as it registers the force exerted to overcome the valve and not the pressure actually in the tire. The gauge must be actually fitted to the valve so that the pressure in the tube can blow out directly into the gauge when the small pointer inside the gauge presses the valve down. This does not take place with the tester fitted to the pump, and in one or two instances it was found to be about 20 pounds above.

In making these tests the length of contact around the periphery of the tires was, of course, shown. For convenience the lengths were eliminated, thus making it possible to show seven points in one example and eight pressure conditions in the other, giving the width of contact only. It is the firm belief that the peripheral length of contact is of value when making observations in general, it being the expectation that area of tire-contact is the figure that is wanted in the long run. It is just possible that some good will come from noting not only the width, but the area of tire-contact as well, comparing the one with the other, and, perhaps, making a set of charges in order to see how the values increase with increasing pressure and how they relate to each other as well. In the testing machine made to work on this principle the results show very clearly.

TABLE OF TESTS MADE TO SHOW AMOUNT OF DEFLECTION

Body and H.P.	Sizes of Tires		Pres. lb on sq. in.	Right front		Left front		Right rear		Left rear	
	Front In.	Rear In.		Top. In.	Bot. In.	Top. In.	Bot. In.	Top. In.	Bot In.	Top. In.	Bot. In.
40 hp. Lim.	935x135	935x135	60							4 3-16	3½
Delaunay...	non-	skids		4½	3 1-16	4 3-16	3½	4½	3 1-32		
30 hp. Lan.	33x4	33x4									
Chalmers..	plain	tread	55	3 7-12	3						
			42					3 7-12	2½		
Limousine.	37x5	36x4½	40	4½	2½						
48 hp. 6 cyl.	Q. D.	plain	55					4½	3½		
50 hp. Lim.	36x4½	36x4½	90	3½ (well	3½ worn)						
			60					4	3½		
Touring....	34x4	34x4	35	3½	2½						
40 hp. 7 pas.			22					3½	2½		

Tires and Pressures

Too Much Importance Cannot be Attached to Right Tire Pressure

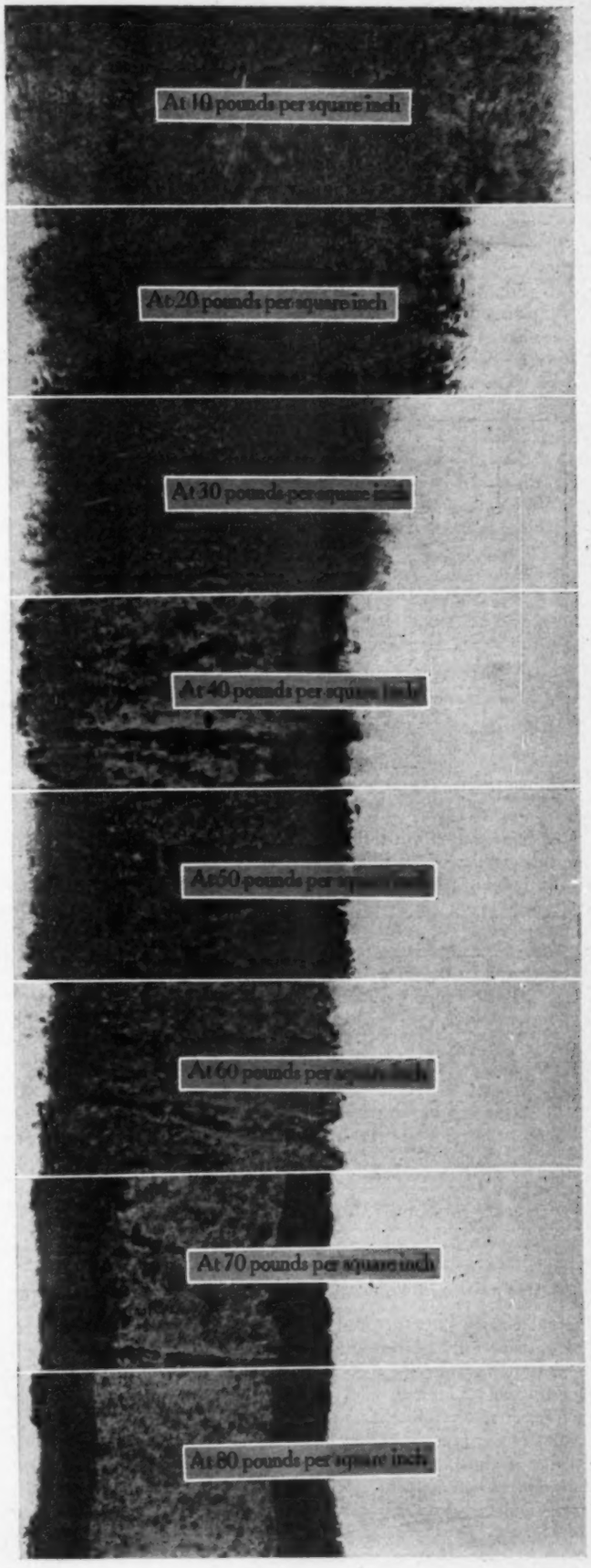
THE first point to take into consideration is the weight of the car, and this is a matter that seldom occurs to the owner. By weight is meant the complete weight of the car loaded with full equipment of passengers, tools, luggage and full tanks Even before the question of sizes of tires is considered this should be found out and a certain margin for safety allowed in case additional weight is carried from time to time.

The way to ascertain the weight is to place the front wheels on the scale first and the rear wheels afterward to find what weight is carried on each axle. This amount halved will give the proportion each wheel has to carry.

The following table shows the weight a given size tire is made to carry and the pressure to which it should be inflated:

Diameter of tire in inches	Maximum allowable weight on wheel	Air pressure in pounds per square inch
2 1-2	225 pounds	50
3	350 "	60
3 1-2	600 "	70
4	750 "	80
4 1-2	1000 "	90
5	1000 "	90 to 100
5 1-2	1200 "	100 to 105

If the flexure of one tire is greater than another for the same pressure it is as well to reduce the pressure of the highest to correspond with the other to equalize the flexures. There is danger of extra tire depreciation if one tire is blown up stiffer than another and it has been found in practice that this is likely to be true even with equal pressures.


At 10 pounds per square inch
At 20 pounds per square inch
At 30 pounds per square inch
At 40 pounds per square inch
At 50 pounds per square inch
At 60 pounds per square inch
At 70 pounds per square inch
At 80 pounds per square inch

Imprints of a tire under different conditions of pressure, showing how the width of contact decreases with the increasing pressure

1910 Edison Storage Battery

FOURTH INSTALLMENT—DEALING WITH WALTER E. HOLLAND'S PAPER AS PRESENTED BEFORE THE TWENTY-SIXTH ANNUAL MEETING OF THE ASSOCIATION OF EDISON ILLUMINATING COMPANIES, HELD AT FRONTENAC, THOUSAND ISLANDS, N. Y., SEPTEMBER 6, 7 AND 8, 1910.

IN Fig. 16 is shown a series of tests made according to the plan outlined in last issue. It will be seen that the ampere-hour output now decreases very slightly as the discharge rate is increased, but, as before, most of the loss is a voltage loss. The variation of ampere-hour output, average voltage, and

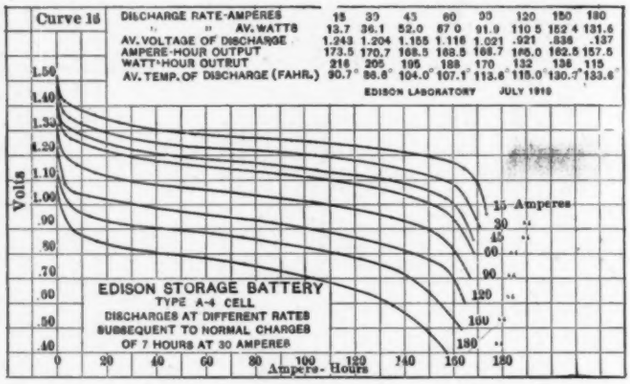

Curve 16
DISCHARGE RATE-AMPERES 15 30 45 60 90 120 150 180
" " AV. WATTS 13.7 36.1 52.0 67 0 91.9 110 5 152 4 131.6
AV. VOLTAGE OF DISCHARGE 1.243 1.204 1.155 1.116 1.021 .921 .836 .137
AMPERE-HOUR OUTPUT 173.5 170.7 168.5 168.5 168.7 166.0 162.5 157.5
WATT-HOUR OUTPUT 216 205 195 188 170 152 136 115
AV. TEMP. OF DISCHARGE (FAHR.) 90.7° 88.6° 104.0° 107.1° 113.6° 115.0° 130.7° 133.6°
EDISON LABORATORY JULY 1910
Volts
Ampere-Hours
15 Amperes
30 "
45 "
60 "
90 "
120 "
150 "
180 "
EDISON STORAGE BATTERY
TYPE A-4 CELL
DISCHARGES AT DIFFERENT RATES
SUBSEQUENT TO NORMAL CHARGES
OF 7 HOURS AT 30 AMPERES

Fig. 16—Discharges at different rates subsequent to charging at normal rates

watt-hour output with discharge rate is shown in Fig. 17 where normal values of these are each taken as 100 per cent.

In judging of the relative merits of storage batteries of different classes there are two appropriate bases of comparison as to output—the basis of weight and the basis of volume. In all non-stationary service such as automobile or car propulsion, car-lighting and so forth, high output per unit-weight of battery is all-important, while the space which a battery occupies, if not ridiculously great, matters little, amounting to a question of vehicle design. In Fig. 18 is given the energy output at different rates of power delivery calculated for one pound of Edison battery; and the same referred to one cubic foot of battery is given in Fig. 19. The figures are based on the total weight and maximum volume—that is, the required volume of battery compartment—of a complete battery of a standard number of cells. These curves were derived from the normal-charge tests shown in Fig. 16. It is not the purpose of this paper to make com-

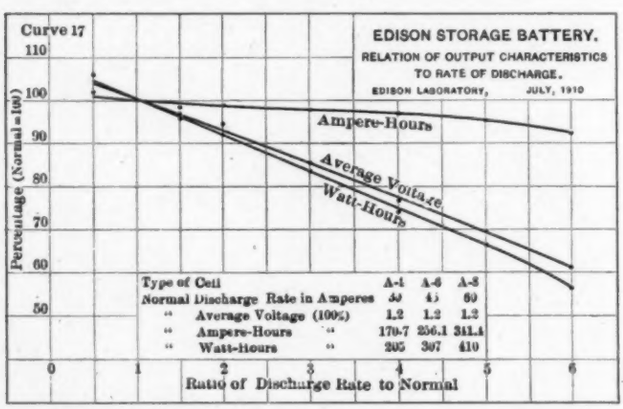

Curve 17
EDISON STORAGE BATTERY.
RELATION OF OUTPUT CHARACTERISTICS TO RATE OF DISCHARGE.
EDISON LABORATORY, JULY, 1910
Percentage (Normal = 100)
Ampere-Hours
Average Voltage
Watt-Hours
Type of Cell A-4 A-6 A-8
Normal Discharge Rate in Amperes 30 45 60
" Average Voltage (100%) 1.2 1.2 1.2
" Ampere-Hours " 170-7 256.1 341.4
" Watt-Hours " 205 307 410
Ratio of Discharge Rate to Normal

Fig. 17—Relation of output characteristics to normal rate of charge

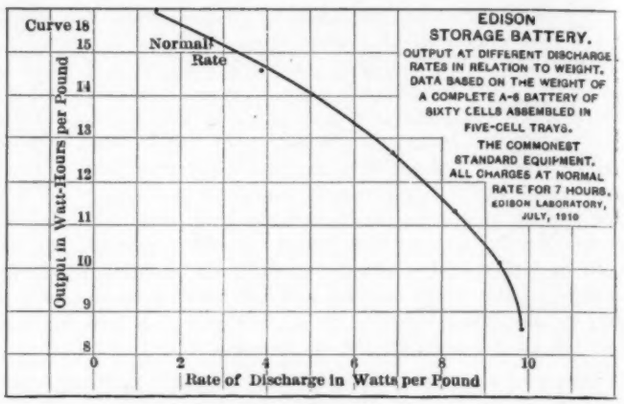

Curve 18
EDISON STORAGE BATTERY.
OUTPUT AT DIFFERENT DISCHARGE RATES IN RELATION TO WEIGHT. DATA BASED ON THE WEIGHT OF A COMPLETE A-6 BATTERY OF SIXTY CELLS ASSEMBLED IN FIVE-CELL TRAYS.
THE COMMONEST STANDARD EQUIPMENT. ALL CHARGES AT NORMAL RATE FOR 7 HOURS.
EDISON LABORATORY, JULY, 1910
Normal Rate
Output in Watt-Hours per Pound
Rate of Discharge in Watts per Pound

Fig. 18—Output at different discharge rates in relation to weight of battery

parisons, but those who have reliable data on lead batteries are invited to plot in comparative curves made on the same basis. They will then see that the Edison battery has an immense advantage in weight over the best lead batteries, while in volume it matches them pretty closely.

The effects of changes of temperature on the behavior of a storage battery are so varied and numerous that a book could be written on this subject alone. Many tests of the Edison battery have been made to determine these effects and an extensive series of temperature tests is now being carried on at the Edison Laboratory; but the subject can merely be touched upon here, and later, in all probability, an entire paper will be devoted to it.

So far, it has been determined that, in general, the cooler a battery is kept the longer will be its life; and that heat during

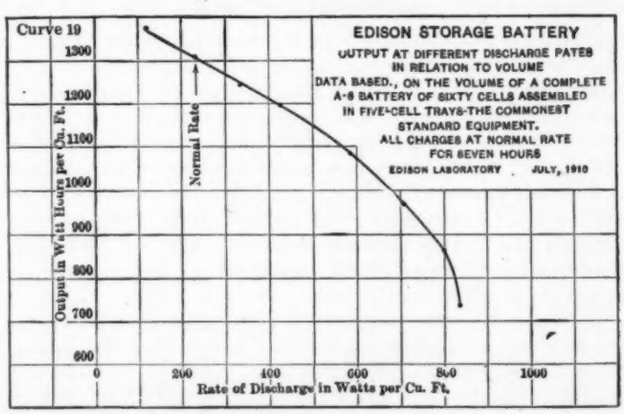

Curve 19
EDISON STORAGE BATTERY
OUTPUT AT DIFFERENT DISCHARGE RATES IN RELATION TO VOLUME
DATA BASED, ON THE VOLUME OF A COMPLETE A-6 BATTERY OF SIXTY CELLS ASSEMBLED IN FIVE-CELL TRAYS-THE COMMONEST STANDARD EQUIPMENT.
ALL CHARGES AT NORMAL RATE FOR SEVEN HOURS
EDISON LABORATORY JULY, 1910
Normal Rate
Output in Watt Hours per Cu. Ft.
Rate of Discharge in Watts per Cu. Ft.

Fig. 19—Output at different discharge rates in relation to volume

charge is more detrimental than heat during discharge. As regards immediate output, the highest results are obtained by charging cool—say at a cell temperature of 75 to 85 degrees Fahrenheit—and discharging hot, that is, at 120 to 130 degrees cell temperature. The output will be reduced if charging is done at a cell temperature of less than 50 degrees F. or more than 105 degrees F., or if a battery is cooled to a low temperature during discharge. The Edison battery appears to be affected in about the same degree as the lead battery by low temperatures.

and the salvation of both in cold weather lies in the fact that they are self-warming. It is a providential arrangement that the internal resistance of a cell becomes greater as the temperature decreases, because on this account the generation of heat within a battery is greatest when the battery is cold and automatically decreases as its temperature rises.

An interesting but not at all surprising characteristic of the Edison battery, which probably is common to storage batteries in general, is the fact that the rate of loss of charge during idleness varies with the temperature at which it stands, the loss being slight in the cold and greater as the temperature increases. Fig. 20 shows the results of two series of tests in one of which the cells after charge were immediately put in an ice box to stand, while in the other case the cells were left to stand in a room whose temperature averaged close to 75 degrees F.

The sturdiness of the Edison battery has often been summed

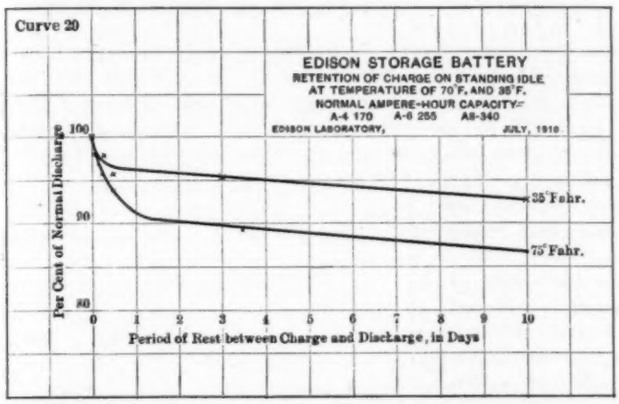

Curve 20
EDISON STORAGE BATTERY
RETENTION OF CHARGE ON STANDING IDLE AT TEMPERATURE OF 70° F. AND 35° F.
NORMAL AMPERE-HOUR CAPACITY—
A-4 170 A-6 255 A8-340
EDISON LABORATORY, JULY, 1910.
Per Cent of Normal Discharge
35° Fahr.
75° Fahr.
Period of Rest between Charge and Discharge, in Days

Fig. 20—Relation of charge on standing idle at different temperatures

up in the statement that it is "fool-proof." And so it is—but there *are* idiots! Therefore the company does not feature this quality, but rather insists on careful handling of the battery at

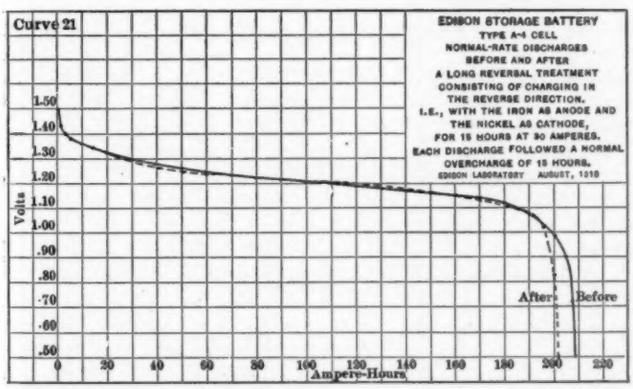

Curve 21
EDISON STORAGE BATTERY
TYPE A-4 CELL
NORMAL-RATE DISCHARGES BEFORE AND AFTER A LONG REVERSAL TREATMENT CONSISTING OF CHARGING IN THE REVERSE DIRECTION, I.E., WITH THE IRON AS ANODE AND THE NICKEL AS CATHODE, FOR 15 HOURS AT 30 AMPERES. EACH DISCHARGE FOLLOWED A NORMAL OVERCHARGE OF 15 HOURS.
EDISON LABORATORY AUGUST, 1910
Volts
After
Before
Ampere-Hours

Fig. 21—Normal-rate discharges before and after a long reversal

all times. Nevertheless, we have made many "fool" tests for our own satisfaction, and there can be no harm in showing the results of some of these to sensible men. The curves are self-explanatory and will be presented with little comment.

Fig. 21 shows that no injury results from connecting up a discharged cell with the polarity reversed and charging in the reverse direction at normal rate for 15 hours.

Fig. 23, contrary to all reason and theory, demonstrates that even carelessness in regard to keeping the plates covered with solution does no immediate damage to a cell. However, this should not be taken to mean that such treatment if persisted in would not ultimately do harm.

Fig. 24 shows successive discharges of a cell following a period of standing with the solution entirely removed. The cell was discharged before emptying the solution and afterward was left

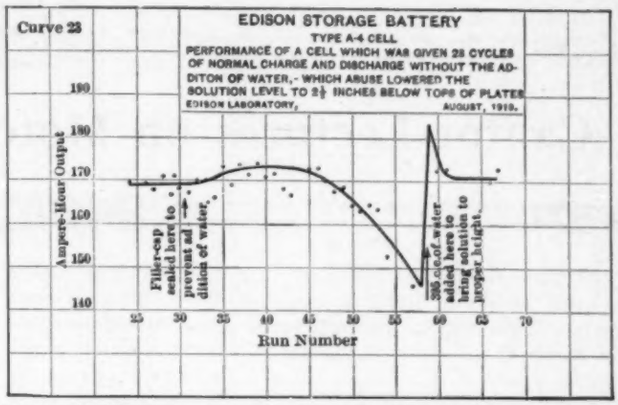

Curve 23
EDISON STORAGE BATTERY
TYPE A-4 CELL
PERFORMANCE OF A CELL WHICH WAS GIVEN 28 CYCLES OF NORMAL CHARGE AND DISCHARGE WITHOUT THE ADDITION OF WATER,- WHICH ABUSE LOWERED THE SOLUTION LEVEL TO 2½ INCHES BELOW TOPS OF PLATES
EDISON LABORATORY, AUGUST, 1910.
Ampere-Hour Output
Filler-cap sealed here to prevent addition of water.
385 c.c. of water added here to bring solution to proper height.
Run Number

Fig. 23—Performance of a cell that was given 28 cycles of normal charge

for two weeks with its filling aperture open. This permitted of enough air getting in to discharge the reserve capacity of the iron electrode by direct chemical oxidation, and consequently it had to be built up again before the cell gave a normal discharge curve. It took five normal-charge runs to do this, as Fig. 24 shows, but could have been accomplished at once—it has been found in other instances—by giving a long overcharge.

The effect of time upon a battery is not always satisfactory, but it is one of the particular claims for the Edison type of

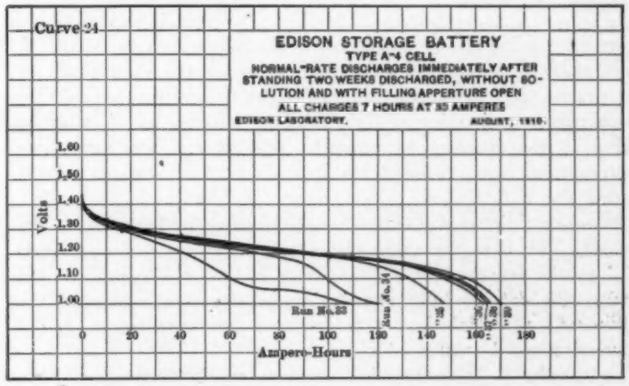

Curve 24
EDISON STORAGE BATTERY
TYPE A-4 CELL
NORMAL-RATE DISCHARGES IMMEDIATELY AFTER STANDING TWO WEEKS DISCHARGED, WITHOUT SOLUTION AND WITH FILLING APPERTURE OPEN
ALL CHARGES 7 HOURS AT 30 AMPERES
EDISON LABORATORY. AUGUST, 1910.
Volts
Run No. 32
Run No. 34
Ampere-Hours

Fig. 24—Normal-rate discharges immediately after standing two weeks

battery that it will remain in good order when out of use and it may be put back into service at a moment's notice, this, too, without any doctoring or hospital treatment whatever. In other words the Edison battery can be set aside and forgotten in any state of charge or discharge for a practically unlimited length of time without fear of injury. Fig. 25 shows comparative discharges of a cell before and after it had stood six months in a totally discharged condition.

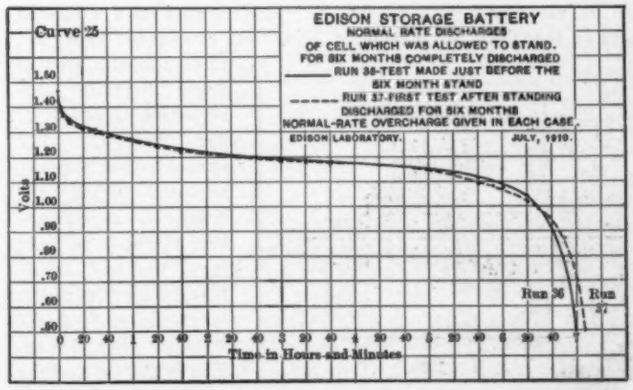

Curve 25
EDISON STORAGE BATTERY
NORMAL RATE DISCHARGES
OF CELL WHICH WAS ALLOWED TO STAND FOR SIX MONTHS COMPLETELY DISCHARGED
RUN 36-TEST MADE JUST BEFORE THE SIX MONTH STAND
RUN 37-FIRST TEST AFTER STANDING DISCHARGED FOR SIX MONTHS
NORMAL-RATE OVERCHARGE GIVEN IN EACH CASE.
EDISON LABORATORY. JULY, 1910.
Volts
Run 36
Run 37
Time in Hours and Minutes

Fig. 25—Normal-rate discharge of a cell which was allowed to stand for six months

Cantor Lectures on Motors

PROFESSOR W. WATSON, D.SC., F.R.S., DELIVERED A SERIES OF LECTURES ON THE GASOLINE MOTOR, OF WHICH THIS IS THE THIRD INSTALLMENT—BY PERMISSION OF THE ROYAL SOCIETY OF ARTS

THE light from an arc lamp, A (Fig. 11), passes through a lens, B, which forms an image of the crater on a small hole in a diaphragm, C. The light which passes through this hole falls on the concave mirror, G, and is reflected back on to the plane mirror, K, which is placed at an angle of 45 deg., and an image of the hole, G, is then formed either on a ground-glass screen, D, or on a photographic plate. The mirror, K (Fig. 10), is mounted on an axis, which is given a reciprocating motion by means of the lever, L. The end of this lever is joined by a short connecting rod to an eccentric, M, attached to the shaft, N. This shaft is rotated at the same speed as the crankshaft of the engine, and hence the spot of light is given a to and fro movement in a direction at right angles to that in which it moves owing to the changes of pressure, this to and fro movement representing, on a reduced scale, the actual movements of the piston.

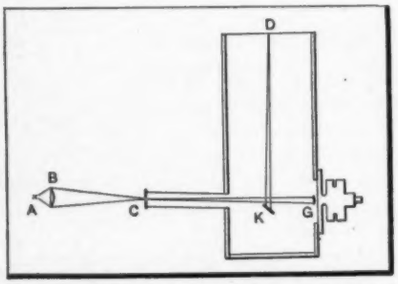


Fig. 11—Section of the Manograph showing the beam of light striking the poised mirror

By making the connecting rod which joins the lever, L, to the eccentric, M, bear the same ratio to the throw of the eccentric as does the length of the connecting rod of the engine to the stroke, the spot of light exactly reproduces the motion of the piston, and no correction on account of the finite length of the connecting rod becomes necessary.

The shaft, N (Fig. 10), is driven at crank shaft speed by a light bicycle chain, the movement being transmitted through a phase-adjusting device shown in Fig. 12 (*a*). The sprocket, A, is mounted on a shaft, B, which carries at its other end a bevel wheel, C. This wheel transmits the motion, through an idle wheel, to the shaft, F, which is directly coupled to the shaft, N, of the indicator. The shafts, B and F, can be rotated with reference to one another by rotating the axle, G, on which the bevel wheel, D, is mounted. One end of this axle is carried by the block, K, which can turn freely about B and F, while the other end is held in a fork attached to the plate, H. This plate can be rotated with reference to the plate, J, being held in certain definite positions by a pin, I, which drops into a series of holes in the plate, J. The plate J is itself capable of being rotated through a small angle between two adjusting screws, L, Fig. 12 (*b*). The phase is first roughly adjusted while the engine is at rest, so that the spot of light is at the end of its travel when the piston is at the end of the stroke. Then the engine is started and the spark retarded, so that the charge is fired after dead-center, and by means of the screws, L, the diagram is adjusted till the portion representing the top of the compression stroke, and the first part of the working stroke, is as shown in Fig. 13 (*a*). If the phase is too much advanced, so that the spot of light reaches the end of its movement before the piston reaches the top of the stroke the diagram obtained is as shown in Fig. 13 (*b*). If the phase is retarded then the diagram is as shown in Fig. 13 (*c*).

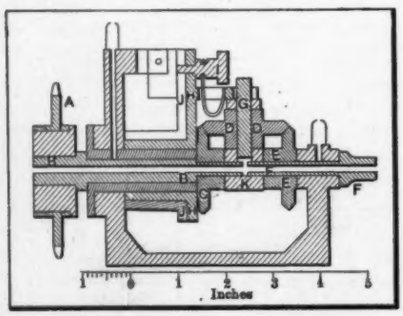


Fig. 12 (a)—Cross-section of the phase-adjusting mechanism of the Manograph

The correct adjustment of the phase is of very great importance. Thus, if the phase is 6 deg. out of adjustment, the diagram obtained in a certain engine was found to be such that the mean effective pressure obtained came out as 100 pounds per square inch, while the corresponding value from a diagram in which the phase was correct was 89 pounds per square inch.

Two examples of diagrams obtained with this indicator are given in Fig. 14. In addition to the full diagrams obtained with a thick diaphragm, two diagrams are given obtained with a thin diaphragm, so as to show the exhaust and induction strokes on an enlarged scale. These diagrams are taken from a four-cylinder engine, the bore of the cylinders being 85 millimeters and the stroke 120 millimeters. In each diagram the induction stroke is indicated by a single arrow head, the compression stroke by two, the working stroke by three, and the exhaust stroke by four. It will be noticed that while at a speed of 840 revolutions per minute the pressure in the cylinder at the end of the induction stroke is very little below atmospheric pressure, at the speed of 1,300 the pressure at the end of the induction stroke is about 2 pounds per square inch below atmospheric pressure. This shows that while at the lower speed the cylinder has time to get filled up by the new charge, this is not the case at the higher speed. The rapid rise in pressure at the end of the exhaust stroke at the higher speed is also to be noticed. This is produced by the gases in the exhaust manifold flowing back into the cylinder, or at least the further escape of the gases from the cylinder being prevented, caused by the rapid rise in pressure in

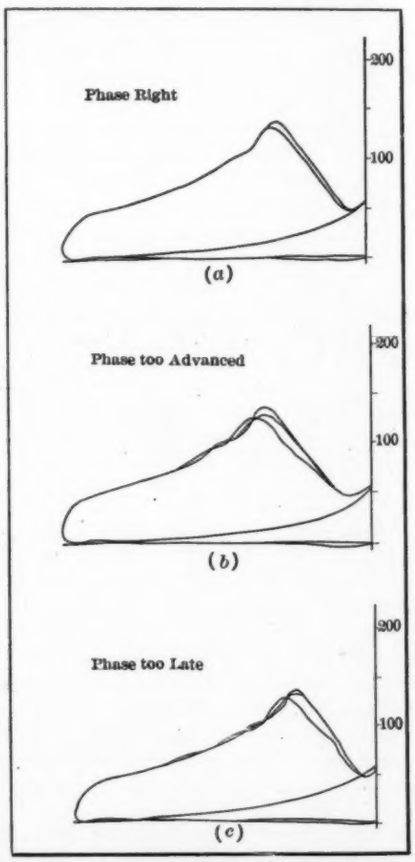


Fig. 13—Manograph cards under different conditions

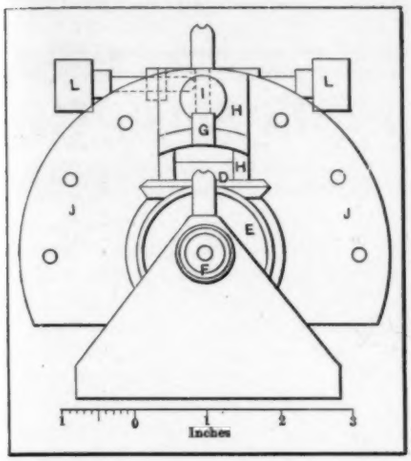


Fig. 12 (b)—Diagrammatic illustration of the phase-adjusting mechanism

the exhaust manifold due to the sudden entry of the exhaust gases on the opening of the exhaust valve in another of the cylinders. It is probable that if there was a separate exhaust pipe for each cylinder, so that the commencement of the exhaust of one cylinder would not thus prevent the free exhaust at the end of the stroke of the preceding cylinder, the filling up of the cylinder would be greatly improved, and hence the power developed by the engine increased.

In Fig. 15 are shown some indicator diagrams taken from a small single cylinder two-cycle engine (bore 3.25 inches, stroke 3.25 inches). In the figure the two upper diagrams are taken from the cylinder, the top diagram in each case corresponding to a mixture poorer in petrol than the middle one. The bottom diagram in each figure is taken from the crankcase, in which the charge is slightly compressed before being transferred to the working cylinder.

At a speed of 600 revolutions per minute it will be observed that, owing to the uncovering of the exhaust port the pressure in the cylinder sinks to atmospheric some little time before the end of the stroke. Further, the crankcase diagram shows that

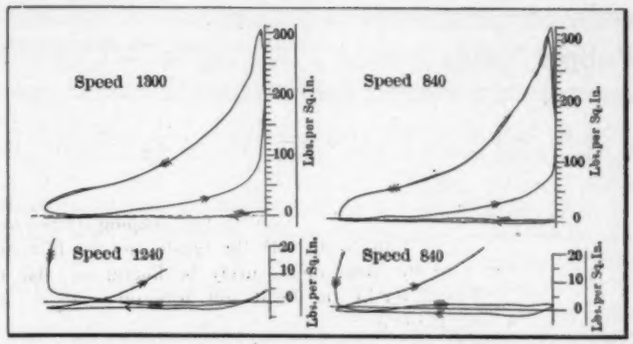


Fig. 14—Examples of indicator cards using diaphragms to obtain certain results

the fresh charge is able to fill up the crankcase very nearly to atmospheric pressure during the time the third port is uncovered by the lower part of the piston. At a speed of 1,500 revolutions, the pressure in the cylinder does not fall to atmospheric till very nearly the end of the stroke. Further, it will be noticed that the maximum pressure attained, and the mean effective pressure, is considerably less than at the lower speed. The crankcase diagram shows very clearly that the fresh charge has not time to enter from the carbureter, so that on the down stroke of the piston the pressure does not rise to atmospheric till more than half the stroke is complete. Further, when the inlet port is uncovered by the piston the pressure in the cylinder is still greater than the pressure in the crankcase, and hence some of the burnt gases blow back into the crankcase, causing a marked rise in pressure. It is evident, from the diagrams, that the chief cause of the decreased mean effective pressure in this engine at high speeds is that the charge has not time to get into the crankcase, and that if a larger port, open longer, were employed, the engine would have greater power at high speeds.

What Is Hardness?

Prof. Turner Divides Hardness into Four Separate Classifications—How to Measure It Is a Problem

HARDNESS is a physical property that many physicists have endeavored to define to the satisfaction of themselves and their confreres with but limited success. Turner states that hardness has four distinct qualities, i. e., tensile hardness, cutting hardness, abrasion hardness, and elastic hardness. It has been found that relative hardness varies with the method in vogue for its determination, and last Summer, when the Society of Automobile Engineers was meeting at Detroit, the Shore scleroscope was illustrated, and its use propounded concomitant with an attempt to elucidate the property called hardness, but it can scarcely be claimed that the audience was much impressed with the clearness of the definitions that were propounded.

It is all very well to state that a piece of metal is of a certain hardness; this is as much as to say that under certain conditions it will offer a certain resistance to (a) penetration by another body, (b) permanent deformation, (c) abrasion, and (d) elastic deformation, with, perhaps, other manifestations that might well be classified with hardness, so called, as when two or more of these conditions are set up simultaneously.

This is an extremely important subject in automobile work; balls for ball bearings, for illustration, should resist deformation and the races in which they roll should resist penetration. But the bearings of crankshafts should resist abrasion, and elastic deformation is but the prelude to a broken crankshaft. Certain metals offer especial advantages in one way or another, and alloying has for its object the fortifying of the metal against the pressures that are exerted to overcome hardness. Heat treatment is intended as a means for inducing various degrees of hardness—the field is rich in unknown quantities.

British Exports and Imports

Show Increase for First Nine Months of 1910 Over 1909

THE English automobile journals have lately been looking with astonishment at what they term the "American Invasion," and the figures issued by the Board of Trade department of the Government clearly show an increase in the demand not alone for home consumption but likewise for export purposes.

The number of cars imported for the first nine months of the present year is 8,352 (this number includes chassis), which is 1,833 more than the corresponding period of last year; and 2,673 cars and chassis were exported, being 872 more. The value of imports was $19,248,500, being $2,464,500 more than last year, and the value of exports was $8,777,000, being $3,487,000 more.

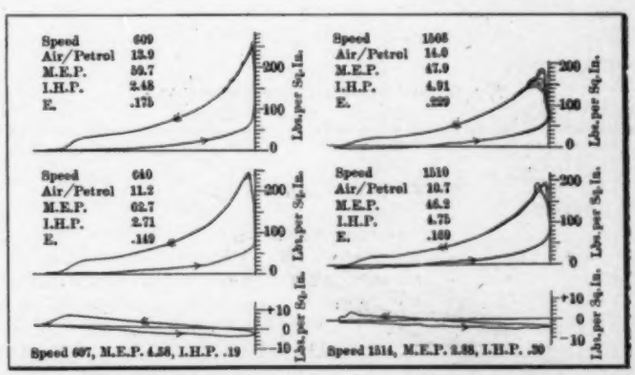


Fig. 15—Manograph diagrams taken from a small 2-cylinder motor

Poppet Valve Heads

Heat and Shock Are Enemies To Be Thwarted

CARBON steel, of the grades known as mild steel, or machinery steel, have never proved to be efficacious for valve-heads, although cast gray iron seems to work fairly well. It is of course true that much of the trouble that has been experienced was on account of the inferior shaping of the valves; the heads were not properly joined to the stems. The shaping of the head of a valve has something to do with the result, and the fillet that joins the head to the stem must surely be liberal, or else the heat that is picked up by the head will accumulate there, due to the lack of a path of travel for the same down the stem and away to the water of the jacket. But if the valve-seat is properly water-jacketed, much of the heat will traverse the gap and pass away through the seat. Even this relief is far from adequate for the purpose, but when the valve is fastened to the stem by a liberal supply of metal in the fillet, it is then possible to realize good results, provided the metal used in the head is of a character to withstand the heat changes and the hammer blows that must fall to its lot to share.

It is not necessary to place reliance upon some one type of steel. Of the materials that are used with success in this class of work the following are mentioned:

(a) Special high carbon steel.
(b) High nickel alloy steel.
(c) Nickel heads on carbon steel stems.
(d) Cast gray iron heads on carbon steel stems.

PROPERTIES OF HIGH CARBON STEEL FOR VALVES

Chemical Composition

Carbon	Silicon	Sulphur	Phosphorus	Manganese
115	10	0.015	0.012	0.40

Physical Properties

Tensile strength in pounds per square inch	Elastic limit in pounds per square inch	Elongation per cent. in 2 inches	Reduction of area in per cent.
149,800	50,000	5	16

[Note.—The best way to form the heads is in a spinning machine; work may be done hot with great facility; it is possible to do the work cold.]

PROPERTIES OF HIGH NICKEL ALLOY STEEL FOR VALVES

Nickel	Carbon	Silicon	Sulphur	Phosphorus	Manganese
35	0.10	0.15	0.012	0.012	0.35

[Note.—It is optional with the designer to use this material for heads only, or with integral stems. If heads only are to be of this material, the stems may be of mild steel and autogenous or electric welding processes may be used to join the heads to the stems.]

PHYSICAL PROPERTIES

Tensile strength in pounds per square inch	Elastic limit in pounds per square inch	Elongation per cent. in 2 inches	Reduction of area in per cent.
85,000	55,000	25	50

Nickel in Steel

Some Properties of Nickel Steel as Used in Automobile Work

WHEN the carbon is low, say 10 points, and the nickel is somewhat high, say 4.50 per cent, if all the other contents are well regulated, it is then that nickel steel offers wide possibilities in automobile work. The physical properties will abound about as follows:

PHYSICAL PROPERTIES (NORMAL)

Tensile strength in pounds per square inch	Elastic limit in pounds per square inch	Elongation per cent. in 2 inches	Reduction of area in per cent.
114,645	93,167	17	46
AFTER HEAT TREATMENT			
123,033	96,581	14	55
AFTER FORGING			
100,000	72,000	16	44
IN PRESSED FORM			
100,000	80,000	16	43

In this steel the phosphorus and sulphur contents are held at a low point, 0.012 being a good approximation for both elements, and with a fine selection of ores, the low metalloids, and carbon always below 15 points, the steel possesses remarkable qualities.

Fire in the Small Garage

IN view of the high rates of insurance many owners of a small garage do not take out policies, preferring to run the risk of a possible fire. This line of action is sometimes dictated by a lack of funds and sometimes by a willingness to trust to luck.

But whatever the cause which may lead one to the neglect or refuse to take out insurance on his garage, he should in any event observe certain simple precautions that will lessen the possibilities of a fire, and he should provide certain simple safeguards that will aid in lessening the damage that might occur in case a fire should get started.

The precautions against fire which every conservative owner will take include the firm refusal to store or permit to be stored even small quantities of gasoline, wood alcohol, ordinary alcohol, kerosene, lubricating oil or other inflammable substances in or near the garage.

The gasoline in the car's tank is a source of danger because: (1) There is always the possibility of a leak developing, which will permit the liquid to flow out over certain parts of the chassis onto the floor or into the drip pan; (2) the needle-valve of the carbureter may not fit the seat properly—it may be held open by so small an object as a grain of sand—this would cause the gasoline to flood the carbureter and overflow onto the floor. The fact that there is gasoline on the floor or dripping from the car is not necessarily a dangerous condition, but it becomes so instantly if a burning match be dropped, or if a stray electric spark due to a short-circuit in battery, timer, magneto or other cause, is produced on attempting to start the engine. Even a spark caused by the nails in one's shoes coming in contact with a hard object (concrete floor, for instance) is perfectly capable of starting a disastrous fire if the conditions are favorable. To avoid the possibility of the carbureter flooding it is, of course, only necessary to remember to turn the cock in the gasoline supply pipe in the evening or at other times when the car is to be left standing for some time.

The "No Smoking" signs posted in all the well-conducted public garages are not the result of the owners' dislike to the use or odor of tobacco, nor because the burning tobacco is necessarily dangerous, but because tobacco, like other substances, must be raised to its kindling temperature before it will burn. The usual method of doing this is by applying a flame from a match or other source. Unfortunately, it is inevitable—inescapable—that the flame which lights the tobacco will also ignite a mixture of gasoline vapor and air. This is a certainty. It happens every time. When it doesn't happen it is because no such mixture is present in the immediate vicinity of the flame.

Another source of danger which is sometimes unsuspected arises from the position of the gasoline tank on the car. If this is placed across the body under the front or rear seat, with the filling vent at or near either end, the tank should never be filled quite full; or if it is, the driver should not allow the car to stand inclined at an angle toward the side on which the vent is placed or on a steep down-grade until after the car has been driven long enough to consume sufficient fuel to lower the level in the tank, otherwise the gasoline may easily overflow and under favorable conditions become ignited.

In view of the fact that water will not extinguish burning gasoline or other burning oils, but will, if thrown upon them, merely spread them, thus giving them greater power to cause damage, it is obvious that water should not be used on a gasoline fire. But it frequently happens that while the burning gasoline is rapidly consumed itself, it ignites other substances, such as wood, cloth, upholstery, etc. Under such circumstances water

OWNERS OF SMALL GARAGES ASSUME FIRE RISK; LACK OF FUNDS SOMETIMES THE CAUSE; TRUSTING TO LUCK IS COMMON PRACTICE—BY JAS. S. MADISON

becomes effective after the gasoline (or oil) has been burnt up, to prevent the spread of the flame. Each small garage should therefore have as a part of its equipment several buckets constantly filled with water and kept in definite places; also a bucket or two of clean, fine sand. The latter will, when thrown upon a small gasoline fire, smother it.

But the best means of subduing such a fire is by means of chemical fire extinguishers. There are two classes of these on the market—the "dry" extinguisher, which consists of a metal tube, tin, zinc or copper, about 36 inches long and 2 or 2 1-2 inches in diameter, containing dry, powdered ammonium acid carbonate, also called ammonium bicarbonate. These extinguishers after being filled are hermetically sealed by having the top, through which a hook projects, soldered in carefully, but lightly. They are usually kept suspended from a stout nail or screw at any convenient point on a wall or door jamb. If occasion arises for using them they are given a sharp downward jerk, which pulls off the top; the contents are then sprinkled generously on the incipient fire.

This dry powder on being heated even slightly decomposes into ammonia, carbon dioxide and water vapor. These are gases which are not only non-combustible, but excellent extinguishers in that they surround the burning object and thus exclude the oxygen of the air, which is one of the necessary factors in all combustion. They may be purchased in the market at from 50 cents to $3 each, depending upon the size. If the owner prefers he may make one himself if he has the ability to use a soldering iron. If not, the local tinner will make the tube and the chemical, ammonium bicarbonate, which must be *dry* and finely *powdered*, can be purchased from or ordered through any reliable drug dealer.

The best device, however, is the other type of chemical extinguisher, that which is universally used, and consisting of a copper vessel holding three or more gallons of water containing the proper amount of sodium bicarbonate—baking soda—dissolved in it. The upper part of the vessel contains a glass bottle partially filled with concentrated sulphuric acid, which does not come into contact with the soda solution until at the moment when the extinguisher is to be used; it is then turned upside down, which causes the chemicals to be brought together. This results in the generation of large volumes of carbon dioxide gas, which saturates the water and forces it under great pressure out of the rubber hose attached to the extinguisher.

As pointed out above, water is not a good agent with which to fight a gasoline fire, but the water coming from this extinguisher is highly charged with carbon dioxide—it is essentially a carbonated water, such as is served at soda fountains, minus the flavoring syrups. This renders it an effective extinguisher.

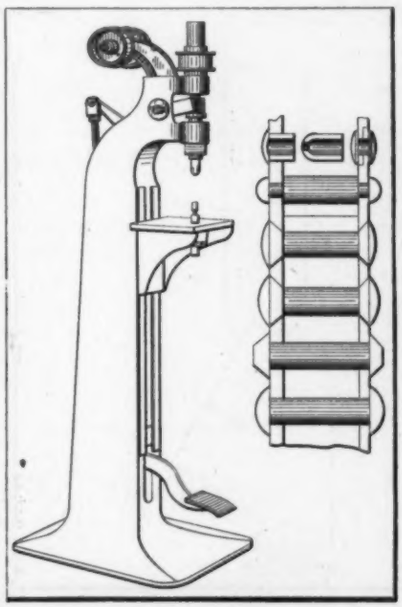
Another excellent means of subduing a gasoline fire is offered by the steel cylinders filled with carbon dioxide or carbonic acid, as it is more popularly called, under great pressure, which the motorist often carries in his car or keeps in the garage for inflating tires. If the cylinder be taken out near the fire, the gas turned on and the current of gas directed against the source of the fire satisfactory results will be obtained in nearly every case. One must be careful not to confuse "air bottles" filled with carbon dioxide with "air bottles" filled with compressed air, which are also used for inflating tires. To use the latter in subduing an incipient fire would be a fatal mistake. A current of air directed against it would only increase the conflagration in the same manner that a strong wind aids in the burning of a building.

Rotary Riveting

Riveting That Is Done in the Ordinary Way Is a Noisy Operation

GRANTING that workmen must tolerate all the little inconveniences of their calling, even assuming that they ultimately become accustomed to anything, as when a boiler-maker acquires deafness sufficient to enable him to be happy in a boiler shop, the fact remains that the quality and quantity of the work done in a plant depend upon the environment to a considerable extent; imagine the writer of this article trying to think in a boiler shop, or alongside of a battery of indefatigable riveting machines of the kind that strike a blow every second, every blow making a sound that would put a Gatling gun to shame Necessity was said to be the mother of invention. Would that mother would spank the men who employ the class of riveters that strike a hammer blow! Such noises are neither pleasant nor profitable. The illustration here given of spinning the heads on rivets has the dual advantage of doing the work 120 times faster than the old way, and the further argument that accompanies noiseless performance. It is the same old story in new garb; the silent performer does the best work. This machine is known as the Grant rotary riveter, made by the Grant Manufacturing Company, of Bridgeport, Conn., and it is capable of doing riveting of every class on a basis so efficaciously that the range of work is all the way from the riveting of sprocket chains to the most complex shapes in a structural steel establishment. The principle of riveting by this process is very simple; the rivet is placed in the usual way and the "work" is then set up on the platen of the rotary riveter with the head of the rivet in the lap of the female tool. The male spinning tool is then brought into contact with the end of the rivet to be headed over. Rotary motion is imparted to the male tool and the metal of the end of the rivet is rapidly spun down, making a riveting job that has appearance as well as security.

In a visit to the plant of the Diamond Chain Company, Indianapolis, Ind., some months ago, the Editor of THE AUTOMOBILE observed that all the riveting was done on special forms of spinning machines, and every automobilist is able to testify to the efficacy of the work done in these chains. The form of riveter as here shown is for general service, but the principle may be utilized in a hundred different ways, and the work may be done hot or cold. The spinning tools may be of any generic type of tool steel, but for hot work it is desirable to select 25 per cent. tungsten steel. Tool steel of this character will hold its hardness even up to a dull red heat. When the heading over is done by spinning the necessity for hot working is eliminated; the metal is spun down and it will run into the space equally all around, ending in a snug fit, and holding the riveted members closely embraced. This scheme of riveting should lend itself to many classes of work utilizing electric motors in the driving when portability is desired. The quality of the work is fully as good as that which is done by the old way.



The noiseless rotary riveter—a godsend in the shop

To Prevent Freezing Trouble

Drain All of the Water Out of the System

BUT the water cannot be drained out unless there are drain openings at all the low points, or if the system is designed on the hydraulic grade principle there must be a drain cock at the lowest point. All modern automobiles are so designed that the radiator, water-pump, piping and fittings are sloped in such a way that when the drain cock is open at the low point, which may be either the pump or the radiator, all of the water will run out. The only danger to be encountered in these modern automobiles, so built, lies in the stopping up of the puny little drain cock that is sometimes employed. It is not uncommon to see unfortunate automobilists in quest of a hairpin which they hope will be small enough to pass up through the diminutive orifice of the drain cock by means of which they hope to dislodge the accumulation of slime that gets in the way of water, and ultimately ends in the disruption of some part of the automobile, when the entrapped water freezes and swells up in consequence. If makers of automobiles persist in violating the ethics of good designing in this way, the fact that water occupies more space when it is congealed, than it does in liquid form, is much to be regretted.

Fig. 4 shows a form of goose-neck piping out of the under-side of the radiator, and the way to avoid freezing trouble is to put a drain cock in the makeup at the lowest point in the goose neck. Fig. 5 presents a suggestion of a centrifugal pump that has the intake in the bottom, thus making it self-draining, so far as the pump is concerned, but the pipe will lead off to a low point somewhere; a drain cock must be put in the pipe at that low point. Fig. 6 is an illustration of a really bad job; the water inlet is up for a considerable distance above the low point of the water jacket of the cylinder. The only thing to do is to put a drain cock in at the lowest point—broken cylinders are high-priced, but they do not rank as luxuries. Fig. 1 suggests a pipe leading from the low point in the water jacket, sliding off to a self-draining point, thus protecting the cylinders from water pockets, which, when properly named, are called ice-houses. Fig. 2 shows a drain cock in the bottom of the radiator, which is there for the purpose of draining out the water residuum, which must always be figured upon when the water outlet is above the bottom of radiator. Fig. 3 is a suggestion of a centrifugal pump showing the water inlet and outlet above the bottom line, suggesting by dotted lines a quantity of water trapped in, which will freeze in a little while on a cold day, and when the motor is started the pump will be torn asunder unless a safety universal joint is used between the pump and the drive; but even if a safety joint is used, it still remains to put in a drain cock, due to the uncertainty of automatic devices as safety joints—they generally work when it is not desired to have them do so, and, like safety devices on elevators, they usually fail to work at the propitious moment.

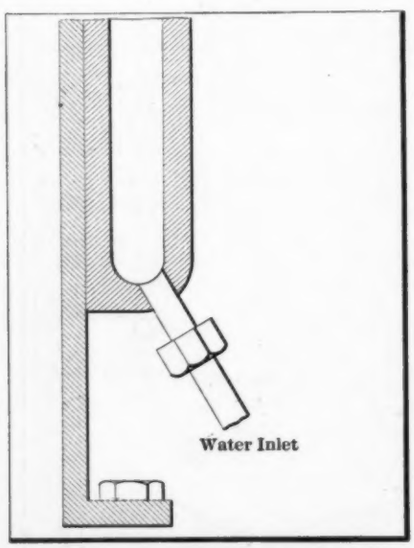


Fig. 1—Proper place for a drain cock in the jacket of cylinders

Letters from Subscribers

Fails to Allow for Varying Ability of Designers

Editor THE AUTOMOBILE:

[2,420]—Please explain in your columns the relative advantage of a 4-cylinder, 4-cycle motor, 5-inch bore and 4¾-inch stroke, and one 5-inch bore and 5½-inch stroke. Which would develop the most power at 1,000 revolutions per minute? At lower speeds, which would develop the most power? Which would run the fastest when developing, say, 30-horsepower? Would one be classed as a high-speed motor, and the other a slow-speed motor? ARTHUR G. MINCHIN.

Newark, N. J.

There is no possible chance of any one giving the answer to any of the above questions. As a general proposition, the motor with the largest displacement will deliver the most power. It is not unusual to see a 4-cylinder 4-cycle motor with a 4-inch bore delivering more power than can be obtained from a 4-cylinder 4-cycle motor with a 5-inch bore. The difference lies in the differences in design. A good designer can get more power out of a given displacement of a motor than will be possible in the case of a designer with less skill. Some designers go in for high weight efficiency, others for high thermal efficiency, and more for a modification of the respective qualities, with the idea of producing good average results. It is not fair to compare motors of different design, because each designer may have obtained exactly what he went after. In service, the needs depend upon the character of the work to be done. In racing work, for illustration, what is wanted is maximum power and minimum weight; the designer does not care a hang how much gasoline the motor will drink up. For general touring service, the aim is to realize a sufficiency of power, moderate weight, and a high thermal efficiency. Finally, in relation to the power that may be expected from a motor with a given displacement, it should be understood that there is no method of figuring by any empirical formula as yet devised that will come within a reasonable estimate of the facts as they will be obtained by making a real practical test. It is highly improbable that any of the em-

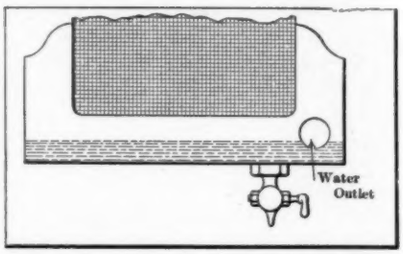


Fig. 2—Drain cock in the bottom of the radiator when the water is taken out farther up

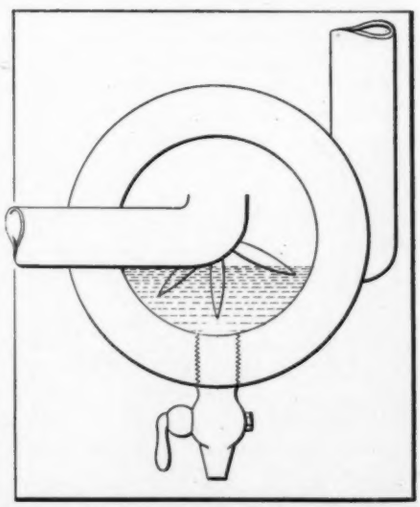


Fig. 3—Drain cock in the bottom of the centrifugal water-pump when the water connections are above the low point

THIS DEPARTMENT IS DEVOTED TO THE ANSWERING OF LETTERS FROM SUBSCRIBERS ON ANY SUBJECT RELATED TO THE RUNNING OF AUTOMOBILES

pirical ratings of motors is in accord with the actual power delivered from them; some go above the empirical rating, and a great many go below.

Piston Rings Must Be Peined After Machining

Editor THE AUTOMOBILE:

[2,421]—Will you kindly enlighten me on the following subject? Assuming a piston ring to be a perfect arch as cut before being compressed to put in the cylinder, are they perfect circles after being compressed? Should they not be perfect arches? Are they made so by machining the point where it is opened, thus making it thinner at that point than on the opposite side, as per diagram? What is the effect if the ring is a perfect arch when compressed if it is allowed to expand to normal?

E. R. STANCLIFF.

Ardmore, Pa.

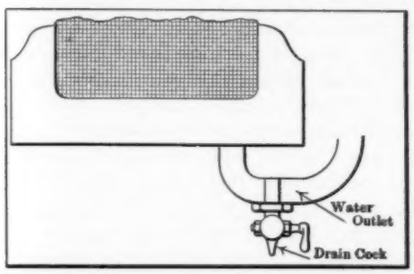


Fig. 4—Goose neck out of the bottom of a radiator that requires a drain cock

Since piston rings are made of cast gray iron, remembering that the iron is more or less under the influence of internal strains, it remains to first machine the rings to near size, then grind them to the desired dimensions, and thereafter pein them to relieve internal strains and to so lay the fiber, or better yet, the texture, as to afford the desired spring qualities on a permanent basis, making sure that the rings will exert the requisite force against the cylinder walls in the first place, and by relieving internal strains and laying the fiber, control future performance.

The Outer Wheels Serve as the Pivot to Turn On

Editor THE AUTOMOBILE:

[2,422]—Being a reader of your paper, THE AUTOMOBILE, I take the liberty of asking your advice in regard to the following:

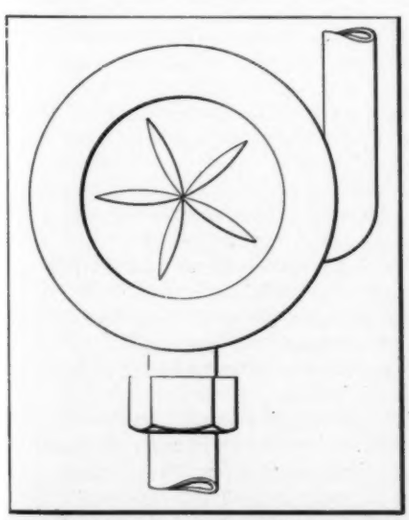


Fig. 5—Scheme of design of water-pump that is self-draining

If an automobile is making a turn at the rate of 60 miles an hour, which wheels leave the ground, the wheels near the curb, or the wheels away from the curb?

AMATEUR CHAUFFEUR

When an automobile is going around a curve, there are two independent tendencies, the first of which is the forward motion and the second is the turning over motion. In turning over, the outer wheels serve as the fulcrum of the lever, or the axis of rotation.

Die Cast Babbitt — Physical Properties and Chemical Analysis of Bearing Metals

THE following shows the compressive strength of "superior" Babbitt purchased from Clum & Atkinson. A die casting was made 1 inch round and 4 inches long and turned accurately to size. Two samples were taken, one from the last shipment and the other from a previous shipment. Each was subjected to 6,000 pounds pressure and readings taken as follows:

(A) Lbs.	Reduction of length in inches	(B) Lbs.	Reduction of length in inches
2000	0	2000	.0156
3000	0	3000	.0156
3500	0	3500	.0156
4000	.0156	——x	
——x		4000	.0312
4500	.0312	4500	.0468
4750	.0468	4750	.0625
5000	.0625	5000	.1093
5250	.0937	5250	.1406
5500	.1250	5500	.1875
6000	.1562	6000	.2656

x—Elastic limit in compression.

Analysis of A		Analysis of B	
Tin	88.840 per cent.	Tin	86.670 per cent.
Copper	4.605 " "	Copper	6.348 " "
Antimony	3.670 " "	Antimony	3.196 " "
Aluminum	1.367 " "		
Iron	.937 " "		

Clum & Atkinson Analysis

Tin	92.60 per cent.
Copper	3.70 " "
Antimony	3.70 " "

Maximum fiber stress per sq. in. in tension, 7162 pounds.

Another Example of Die Cast Babbitt

Lbs.	Reduction of length in inches
2000	0
3000	.0156
3500	.0156
——x	
3750	.0156
4000	.0312
4500	.0468
4750	.0625
5000	.0625
5250	.0781
5500	.1250
6000	.2343

x—Elastic limit in compression.

Analysis	
Tin	93.00 per cent.
Copper	2.95 " "
Antimony	3.40 " "
Iron	.47 " "

Maximum fiber stress per sq. in. in tension, 6858 pounds.

In actual practice the average automobilist is confronted by the necessity of making repairs, and it frequently happens that the special grades of white metal as used in bearings cannot be obtained. If it is possible to procure some of the usual grade of Babbitt, even though it may not be up to standard, which is about what should be expected, it can be rendered fit for use by melting it down in an iron pot and adding charcoal to prevent it from oxidizing, and then add enough block tin to render it "cold short". Add a little of the tin at a time and as the process goes on remove a little of the molten metal from the pot, let it cool, and then see if it fractures readily. When enough of the tin is added the metal will behave like ordinary cast-iron, that is to say, it will fracture when it is given a blow tending to bend it; do not add too much of the tin.

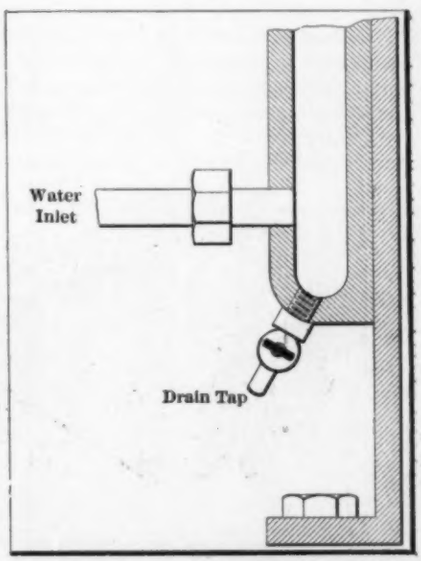


Fig. 6—Plan of making cylinders that is bound to result in freezing trouble unless a cock is put in the bottom

Treating Tire Wounds

Not a Few Autoists Go About It Without Judgment

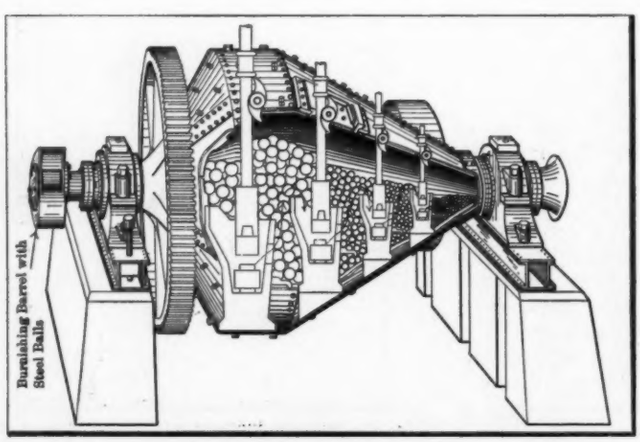
WHEN it comes to the proper handling of punctured tires, some autoists fail utterly on account of their lack of knowledge of rubber and the way that it has to be handled in order to obtain the best result. It is the practice among these automobilists to take a stick and jab it into the wounds after they become large enough to accommodate this savage instrument, without putting them to the trouble of whittling the end down to make a point, and after tickling the wound a little, they then spill a large quantity of rubber cement into, and around the wound, allowing just enough time for the cement to harden before they take to the road and hike it for a mile in just a little more than a minute. It matters very little just what speed the car is made to travel; the rubber is raw as it is dissolved to make cement, and it will not stay in the place where it is put.

Steel Ball Burnishing

A Process of Burnishing Brass Parts by Means of Steel Balls in a Tumbling Barrel

BRIGHT work, as brass and bronze parts on automobile bodies, must be brought to a high polish before it is lacquered, and the cost of polishing is rather too high to expect that good result can be a normal expectation on low-priced cars, unless some quick way can be contrived, by means of which the burnishing may be accomplished in bulk. The illustration here given of a conical tumbling barrel is of interest because it is used with good success in this class of work. The barrel is provided with an opening through which the parts to be burnished are put together with a quantity of steel balls and some ivory soap and a quota of water. The barrel is then rotated at a speed of about 60 revolutions per minute.

There must be enough of the steel balls in the tumbler to prevent the parts to be burnished from battering each other; the rule is to place two pails of steel balls per pail of parts in the barrel, then add a pail of hot water per pail of parts, and 6 ounces of ivory soap is also added per pail of water; put the soap into the hot water before it is placed in the barrel. The sizes of balls used range between 1-16 and 1-14. A special grade of steel balls is made for this work, but in some of the plants where automobile brass parts are burnished by this process the ordinary steel balls of the market are used with good success. This method of burnishing is far from new; it has been used in England for a great many years in the jewelry trade, and the finest kind of burnishing work is done in this way. The process is available for almost every class of work.



Burnishing brass parts by means of steel balls in a tumbling barrel

Don'ts for the Autoist

Don't disregard the prime selling point in salesmanship; show the purchaser how the transaction will redound to his advantage; make sure that it will be to his advantage and then it will be to your advantage also.

Don't anchor a high-tension magneto to a low (in need of attention) sparkplug; spend another dollar and lift the imbroglio.

Don't sing a song of harmonious relations of units in the automobile that you are demonstrating if it is accompanying your music with a display of 57 varieties of noise; either silence the automobile or shut up.

Don't pick out the one weak point in the construction of the car that you are trying to market and call it the best; were the prospect to accept your version, the cars as a whole would rate below the sea level at the ebb of the tide.

Don't let your fraternal connections interfere with your judgment when you are selecting an automobile; if the demonstrator belongs to the same lodge that you acknowledge, make the best of it under the circumstances, but select a good automobile just the same.

Don't let your chauffeur who has the itch purchase the tires that you require for your automobile; a bribed servant is a bad egg.

Don't place yourself in the position of the armless man who purchased gloves because they were cheap; the prudent selection of accessories will reduce the cost of automobiling a mile and a half.

Don't crow about being out of school if you do not know that merit is the automatic finder of the man whom you must reach and convince before you can make a sale.

Don't sink to the level of the dunce who never learned that capital is in the hands of the conservative man; present a conservative proposition.

Don't thoughtlessly cause trouble or expense; if you subscribe to a paper that advertises corsets and automobiles, and you want a catalogue of both at the same time, don't send the letter which is intended for corsets to signal information to the maker of automobiles; it costs quite a sum to attend to such matters.

Don't wait for trouble to come to you, and then sneak out the back door.

Don't treat your automobile as you do your watch; the oil used in lubricating the watch will stay in the jewel cups for two years.

Don't consider that you use watch oil in the bearings of your automobile, and that a single application of oil is all that you will have to apply.

Don't wait until the power plant shows that it is not big enough to overcome friction before you find out what an oil can is for.

Don't act on the suggestion that a surfeit of poor lubricating oil is equal to a small quantity of good oil.

Don't spill oil all over the surfaces of the car and take it for granted that it will penetrate into the journals.

Don't try to dissolve mud out of the oil holes and expect oil to go through and do its work besides.

Don't forget that grit will pass through a mighty small crevice.

Don't overlook the dual purpose for which lubricating oil is used; it keeps grit out, and it keeps the bearings from seizing the journals.

Don't take it for granted that an automobile will last forever just because it is new when you buy it.

SOME INJUNCTIONS IN FAVOR OF TELLING THE TRUTH; ARGUING AGAINST PROCRASTINATION; REMINDERS OF THE VIRTUE OF TIMELY PREVENTION

Don't forget that it is the bearings (as a rule) that wear out first.

Don't try to persuade yourself into believing that the bearings will last long if they are overworked and underfed; you would fag out yourself under such conditions.

Don't feed the bearings on sand; it gives them indigestion.

Don't try a table d'hôte dinner on the bearings; they have the likings of an Eskimo and are rather fond of blubber.

Don't forget that the Eskimo is uncivilized and takes his blubber raw; bearings are somewhat more refined, and have a taste for refined blubber.

Don't think when reference is had to blubber that it is a license to use animal oil in automobile work; the animal fats are acid-producing materials.

Don't forget that every form of acid will etch the polished surfaces of the balls and races of the bearings.

Don't read about ball bearings and not learn that half the value lies in the polished surfaces of the balls and raceways.

Don't overlook the efficacy of grease as a seal for bearings by means of which the bearings are protected, but the form of protection comes with using enough grease so that some of it will traverse out from the bearings, thereby heading off the influx of foreign matter.

Don't start off on a tour with a quart of lubricating oil promising yourself that you will stop at convenient points along the road and gather in a new supply as the occasion requires—there may not be any convenient points.

Don't take a whole week finding out the name of the brand of oil that you feel sure will protect your automobile from the ravages of time, and then go on the road with just enough of it to put in your eye, knowing full well that you will have to patronize a wayside garage and pay good money for whatever it affords, whether or not it is the lubricant you require.

Don't start out with an insufficiency of lubricating oil, travel 10 miles in the direction of no supply, discover that the oil is all gone, and then drive the automobile for the same distance with the bearings dry, promising yourself that it will be given a flood of oil when you get to the place where they keep it. The right thing to do is to tie the car to a convenient fence-post and hot-foot it 20 miles for the oil you require.

Don't whine about the upkeep of your car if it costs too much to maintain; the main reason why it breaks down is because you give it your choicest brand of neglect.

Don't forget that a car will run four times as long using one-quarter of the customary supply of oil if you take the trouble to dab the oil onto the bearings instead of over the outside.

Don't go around looking for a carbon remover until you have reduced the flow of lubricating oil to that which will serve for its intended purpose, thus limiting the accumulation of excess carbon to the minimum.

Don't be surprised if you succeed in so regulating your lubricating oil that it will do its intended work without precipitating an excess of carbon to foul up the piston rings and the combustion chamber surfaces.

Don't compel your motor to join you in the smoking habit; if you like it, smoke your head off; the motor and the public have more refined characteristics.

Don't buy stock at par in a mystery; if the lubricating system is so mysterious that you cannot make it out, sell.

Electrical Heat

A Formula That Will be of Value in Vulcanizing with the Current

THE amount of heat that will be delivered up by the electrical current will be directly proportional to the actual (hot) resistance of the (resistance) wires of the vulcanizer, as measured in ohms, and to the square of the current in amperes. The algebraic expression for this delivery of energy may be stated as follows:

Let,

W = energy in watts;

I = current in amperes;

R = resistance in ohms;

When,

$W = I^2R$.

This expression will be of no service to the automobilist more than to show him that there is no guess work about electric vulcanizers. The heat is available in quantity sufficient for the intended purpose, and all that the automobilist will have to do is to use it.

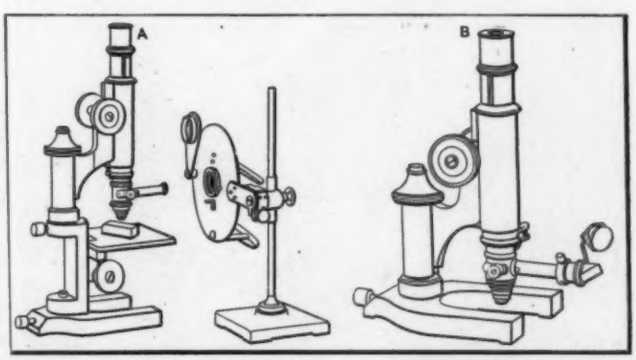
Metallography

Metallographical Problems Demand the Employment of Micro-instruments of Precision and Simplicity

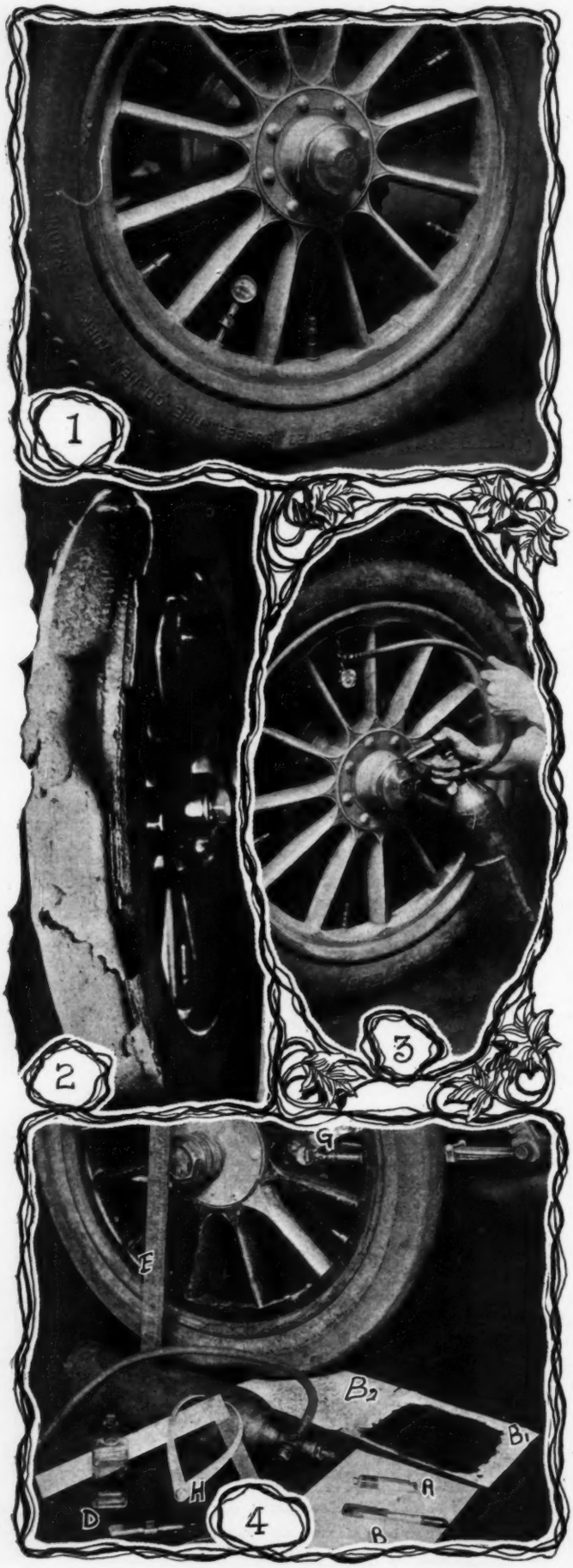
FORMERLY it was contended that metallography, through the use of the microscope, was a process for the metallographical expert, confining research to the advanced laboratory. To-day it is recognized that even a small brass foundry, if it is to turn out advanced work, must be equipped with a microscope of such design and construction that the foundry-man will be able to view the structures of the metals turned out and observe if the composition is suitable for the purpose.

It is due to the work of Dr. William Campbell, the well-known metallographical expert, and professor of metallurgy at Columbia University, that Ernst Leitz, of Wetzlar, Germany, with a branch at 30 East Eighteenth street, New York City, is in a position to place at the disposal of factory experts a form of microscope that is now being looked upon with favor.

The Campbell instrument, as shown here, is mounted at (A) for laboratory research, employing the new opaque illuminator using a special form of illuminating stand, which is designed to afford perfect uniformity of the illuminated field, and a most powerful objective. The stage is adjustable by means of a rack and pinion so designed as not to disturb the relative position of the vertical illuminator and the source of light. There is a fine adjustment on the top of the column. The device for inclining has the virtue of maintaining parallelism between the surfaces to be examined and the front lens of objective. The instrument is arranged at (B) for the examination of large metal surfaces; in this form it is best suited for the man in the shop.



Microscope for Metallographic Research
(A) For laboratory work; (B) For examining large metal surfaces



Care and Repair of Tires

FLEXURE is a large factor in tire depreciation. If it will be remembered that fungus growths make the heaviest inroads on the strength of cotton fabric, it remains to observe that flexure is the next greatest damaging feature. No tire will flex excepting to swallow up road inequalities if it is big enough for the car on which it is placed, provided it is sufficiently inflated.

No tire is big enough for any car unless it can be inflated to roundness under the load. No matter how much pressure is put into a tire, it will not inflate to roundness unless it is big enough. There is no remedy that will be efficacious if the tires are not big enough. The autoist who puts his money into a car that is provided with insufficient tires will scarcely have to bother about how to keep his tire bills down; it will not be worth while—the bills will go up anyway. But if the tires are large enough to sustain under the load, then, in order to prevent flexure, they must be properly inflated. One of the strange things from the point of view of the autoist of limited experience is that a tire with an air pressure of perhaps 20 pounds per square inch looks almost as well inflated as one that is laboring under a pressure of 90 pounds per square inch; looks are deceiving, even in tires. In the meantime, a tire that is insufficiently inflated will flex out after a few hundred miles of running, whereas a tire maintained at a pressure of 90 pounds per square inch for a six-inch diameter size will run some thousands of miles, depending upon the quality of the tire and other considerations besides the question of air pressure.

The illustrations here offered were taken from actual life, and have for their object partly the education of the man who wants to know, but for the most part as information for the man who thinks he knows. Some of the illustrations portray a condition of tire abuse. Fig. 1 shows a 36 x 4 1-2-inch tire under a pressure of 30 pounds per square inch. The tire expert of the staff of THE AUTOMOBILE held the car up as it was leaving a garage, asked the chauffeur what he was running in his tires, and was answered, "About 65 to 70 pounds." The staff man, being a little keen on tires, put a gauge on them and found the one here illustrated to be inflated to 30 pounds pressure.

Fig. 2 is another tire that was found on an automobile in a garage, the latter being far from clean, with a good many dollars' worth of oil floating around the floor, and the appearance of the tire shows that some of this oil came into contact with the tread of the tire and succeeded in accomplishing the destruction noted. Fig. 3 shows a tread bruise, due to a slanting blow, as a car was being turned around in the street, the wheel coming into contact with the sharp edge of the curbstone. The tire, as a whole, was in good shape; its record showed 2,000 miles of travel, and a prompt repair in this case should add 2,000 miles more to the life of the tire.

Some inquiry seems to have shown that the average chauffeur is very willing to inflate his tires if the owner will furnish a bottle of carbonic acid for the purpose, as shown in Fig. 4. The chauffeur will even know how much pressure there will be in the tires if the owner will furnish a gauge by which he can record the same. In one garage, the other day, it was found that out

Fig. 1—A 36 x 4 1-2-inch tire under a pressure of 30 pounds per square inch. The chauffeur said that the pressure was from 65 to 70 pounds per square inch

Fig. 2—What happened to a tire that was soused in lubricating oil, of which a great quantity lay on the garage floor

Fig. 3—Inflating a tire with carbonic acid, opening the needle valve slowly, watching the gauge to avoid over-inflation

Fig. 4—Showing the simple forms of implements with which much valuable information can be obtained about tires

THIRD INSTALLMENT ILLUSTRATING PROFESSIONAL METHODS OF REPAIRING; DISCUSSING THE BEST WAY TO OBTAIN THE MAXIMUM RESULT

of ten automobiles but one carried a tire gauge. The particular chauffeur who was so fortunate as to be provided with the necessary facilities was making a good record for his owner. The question of the efficiency of carbonic acid for inflating purposes is one that has been debated from time to time, and while it is true that this compound has a finer molecular structure than atmospheric air, hence is more difficult to keep in, the fact remains that carbonic acid gas does stay in the inner tubes with sufficient persistence to serve the practical end, and the Editor of THE AUTOMOBILE, desiring to obtain the opinions of tire makers, wrote to them some time ago, and without exception they stated, "There is nothing about carbonic acid that will injure either rubber or fabric." Since this acid comes in convenient form, and makes tire inflating work more of a pleasure than pumping does, the fact that the tires have to be inflated a little more frequently is a matter of small moment. Tire gauges, as they come from abroad, are marked off to read in kilograms per square centimeter; the American gauges are marked off to read in pounds per square inch. The following is a table of equivalents by means of which the gauges that are marked "kilograms" may be interpreted in pounds per square inch:

Kilograms per square centimeter	Pounds per square inch
1	15
2	29
3	43
4	57
5	72
6	86
7	100

In the investigation of tire conditions in actual practice, the "staff man" used the simple implements as shown in Fig. 4, in which A is a tube of Prussian blue, B is a brush, and D is a bottle of turpentine. When a little of the blue is toned down with turpentine to a painting consistency, and spread over a piece of white paper, if the paper is laid upon the floor at a smooth point, and the wheel of the car is permitted to pass over it, the Prussian blue will transfer to the tread of the tire, after which by substituting a clean sheet of paper B2 and rolling the blue portion of the tire over it, an imprint will be made which shows the area of contact of the tire with the road.

Referring to Fig. 6 of a method of measuring the radial diameter of the tire section at the point of contact and at a diametrically opposite point, it will be observed that the difference in the radial diameter of the section may be found, and when this difference exceeds 3-5 of an inch it is claimed by some tire experts that the tires are either not inflated or they are not big enough for the car on which they are placed. In this connection, it may not be out of place to state that the man who wants to buy an automobile should insist upon it that demonstrations be made with precisely the same diameter tires as those that will be on the new automobile.

Fig. 7 shows the process of measuring a tire to find out how much it squashes down, due to weight, and while this operation is normally not a necessity, it is nevertheless one that might well be performed by the autoist who wants to know whether the tire equipment on the automobile he has his money in is big enough to keep him out of the poorhouse. Fig. 8 shows another operation in the measuring problem, which will explain itself.

Fig. 5—Measuring the sectional diameter of the tire at a point opposite the point of contact to find the difference
Fig. 6—A good tire with a bad bruise which was brought about by trying to turn the car around in a narrow street without backing up
Fig. 7—Measuring the height of the tire from the floor in getting at the amount of flexure
Fig. 8—Measuring the distance from the point of contact of the tire to the rim to see how much the tire squashed down

Speed with Security

BY MARIUS C. KRARUP—A FOUNDATION FOR UNIFORM AUTOMOBILE LAWS BY WHICH HIGH AVERAGE SPEED BECOMES ALLOWABLE THROUGH SUPPRESSION OF NEEDLESS CAUSES OF TRAFFIC DISTURBANCE (FIRST INSTALLMENT)

Suppose there are 18 well-defined causes of traffic disturbances and all regulation, as prescribed by law, is directed against two of these, one being excessive speed and the other sheer mechanical incompetence of drivers (which is rare and not easily regulated), while among the 16 remaining causes many are of the highest importance, though not as yet generally understood, does it not stand to reason that intelligent action for the removal of these 16 neglected causes of trouble should bring about a condition of the traffic so hedged with security that speed regulation may be left to the individuals best able to judge the situation in each instance? The writer proposes a commission of specialists to formulate the requirements and draft a bill on which the legislators of all States may agree by reason of total absence of class bias from its provisions and also the suitability of these provisions for being completely enforced everywhere without hardship to any good citizen or class of citizens.

THOUGH automobile associations have existed for a number of years and have worked together with legislatures in drawing bills for the regulation of automobile traffic, the much desired condition under which all the States of the Union look upon the requirements in the same light and express them in the same words still bears the aspect of a utopian dream. May it be that these requirements have never been set forth without complication with class interests or that, such as they are in the fitness of things, they clash in some irreconcilable manner with true statesmanship, and the problems of the clash lead to many different solutions? An analysis penned with toleration toward divergent views and with frank effort for bringing under consideration all the factors really involved should go a little way in the direction where unity lies. On the other hand, to be too serious and to weigh with petulant insistence every little thing which may disturb somebody's peace of mind or which may tax a granny's ability to keep step with the procession of the world would seem to be superfluous, as even a casual glance at the traffic conditions brought about through the widespread employment of automobiles reveals a number of factors which legislators have apparently never considered and which in themselves are important enough to warrant viewing the subject under a new angle. And from this angle a set of regulations may be the upshot in which the legislators of all States can concur, if the automobile associations do their part in taking united action, laying their case before the Uniform State Law Commissioners at Washington, perhaps, somewhat on the lines which have been followed with regard to road improvement. Assuming that the object of regulation of traffic is in all cases the furtherance of tranquil conditions under which nobody's rights will interfere more than is necessary with the rights of others, the possible causes of disturbance which are to be removed may be divided into five classes, those originating with (A) the driver, (B) the vehicle and its makers, (C) pedestrians and other traffic members, (D) the State and its officials and (E) public opinion as vented in the public press.

A.—The driver may be of (1) an insolent disposition and constitutionally inclined to run roughshod over those upon whom he looks down as inferior beings or as persons unable to defend themselves. He may be (2) inebriated and thereby temporarily deprived of decency, common sense and the full use of his physical faculties. He may be (3) permanently deficient, having poor sight or hearing or being subject to nervous collapse in emergencies.

B.—The vehicle may (4) possess peculiarities affecting the driver's actions and faculties. It may be (5) faulty in its control elements. It may be (6) of appearance so odd as to scare horses or it may be (7) used in districts where any automobile scares horses or temporarily upsets the judgment or ruffles the temper of the drivers of other vehicles. It may (8) possess certain peculiarities through which its speed or the direction of its motion fails to be accurately or quickly perceived by the average person participating in the traffic.

C.—Pedestrians and drivers of vehicles in the traffic, including drivers of automobiles, may be (9) insolent and inclined to make trouble. They may stubbornly insist that the slow member of the traffic has as good a right to all of his slowness as the automobile driver has to some of his speed. They may be (10) inebriated. They may be (11) deficient, having poor sight or hearing, or both, or being subject to nervous collapse in emergencies. They may be (12) unaccustomed to the sight of automobiles.

D.—The State, through its officials, including legislators and magistrates, road supervisors and police, may be (13) poorly informed (14), venal or biased, with all the results flowing from such a condition in the way of bad laws, poorly enforced laws, exasperation of the traffic members, including the automobile drivers, contempt for all regulation, tricky legal quibbling on technicalities. The State may be (15) poorly organized for the enforcement of law.

E.—The public press which voices and shapes public opinion may be (16) following false channels, catering to class interests or failing to spread information of essentials when these lie beyond the horizon of the average reader and when an explanation of them would need to be carefully worked into intelligible form and occasionally repeated in other forms in order to become appreciated.

Among all the considerations mentioned, only those pertaining to the automobile as a vehicle are new in kind, but all of them are raised to a new potentiality through the speed of automobiles. It is therefore not illogical that speed has been the principal subject for regulation in the past. But the logic, while not bad, has been incomplete and one-sided. Speed in itself is universally desired. Even the most conservative prefer to travel at the rate of 40 miles per hour or faster in a railway train. The object of regulation should not be to kill speed, but to render it harmless and to subdue those too much infatuated with its charms, so that they will subordinate it to more important or urgent considerations when circumstances so require. The highest speed consistent with the safety of traffic and the tranquillity of the majority of citizens—and with some allowance for the peculiarities of those who are weak and incompetent—is the best. The object of regulation should therefore be that of raising speed to the maximum which may be attainable with safety and to remove all those special causes mentioned in the foregoing through which speed becomes a source of danger instead of an absolute advantage, and through which, therefore, the necessity arises for reducing speed.

Probably it will be generally admitted that this fundamental viewpoint has not been represented in legislative debates. The keynote in these was in the beginning frankly suppressive on one side and defensive, almost apologetic, on the other. Persecution, while it has been eaten down by its own corrosiveness in course of the years, is still only thinly veiled. All that remains of this unjust feeling of animosity against a form of transportation which is destined to become universal may probably be entirely removed when the progressive camp adopts as its slogan the suppression of all factors in the situation which tend to make traffic unsafe and insist on the other hand on receiving the benefit which such removal will justify in the way of increased speed and freedom from artificial restrictions.

Questions That Arise

SOME OF THOSE THAT COME UP IN EVERY-DAY AUTOMOBILING ARE ANSWERED BY THE MATTER WHICH IS BEING PREPARED BY FOREST R. JONES IN THE NEW EDITION OF THE "AUTOMOBILE CATECHISM" THAT WILL SOON GO TO PRESS

[263]—How do you test the front wheels to see that they will take the proper position for running straight ahead?

Place the wheels in position for running straight ahead. Push the car far enough forward to see that it runs in a straight line. Measure between their tires (or rims) at the back part of the wheel at the same distance from the floor as the center of the hub of the wheel. Use a stick cut to the right length and mark the spots on the wheels between which the measurement is taken. Then push the car forward until the front wheels make half a revolution and measure again between the spots previously marked. The spots will be at the front of the wheel after pushing the car forward. The distance between the spots should be the same as before.

Do not push the car backward just before measuring between the wheels, since that will give them a position different from that of running forward if there is any lost motion in the parts.

[264]—What effect has wear in the distance (transverse) rod upon the position of the front wheels?

It allows the wheels to spread apart in front, so that each has a tendency to run forward toward its own side of the road. This causes a side slipping of the tires and wears them out rapidly. The distance rod connects the knuckles which support the front wheels. It runs across the car parallel to the axle.

[265]—How do you clean a transmission chain and put it in running order?

One link is removable. It has pins fitted with screws or cotter pins which can be easily withdrawn.

Remove from the sprockets and place in gasoline or kerosene a few hours until the grease is cut free, then take it by the ends and run it back and forth through the gasoline to work out the dirt. Hang it up to dry and then submerge in a good machine oil, moving it about to allow the oil to work in around the pins, then apply a grease, such as axle grease, to retain the oil and prevent as much as possible the entrance of dirt and grit.

[266]—How can a broken chain be repaired?

Extra links and pins should always be carried for this purpose. If none are at hand, a short piece of large wire or a wire nail may be used temporarily for a pin. When using such a makeshift for a pin, care must be taken not to rivet it down so as to grip and bind the links together. This repair on the road is not easy in the absence of the proper links.

Wire may be used to replace a link by winding it over the pins to be connected. The pins must be kept at the proper distance apart to correspond with the pitch of the chain, else it will not run on the sprockets. The use of wire in this manner is difficult and only worth while under great necessity.

[267]—How should a double-chain drive be adjusted?

So that the distance between the driving and driven sprockets (between centers) is the same for both road wheels (on both sides of the car).

The distance between the two sprockets over which one chain runs can be measured by a stick cut to suitable length. This distance can be adjusted by means of the threads and nuts on the radii rods which run forward near the extremities of the rear axle, outside of the spring perches.

One of the chains may be tightened more than the other where the distance between sprockets is the same, as above, but this is preferable to an adjustment to make both chains equally tight if they are of different lengths. The latter adjustment tends to make the chain climb on the teeth of the sprocket wheel.

[268]—How can a band brake be relined?

Remove the old lining, which is generally fastened in place with rivets, and replace by another with new rivets. See that the band has an even curvature, either the same in diameter or slightly larger than that of the drum.

Copper rivets are better than those of harder material such as rivet iron. The lining should be countersunk for the rivet heads, so that they will not rub against the brakedrum. The drum is apt to be cut by a rivet which rubs against it, especially if the rivet is of hard material.

[269]—What materials are suitable for brake linings?

Woven cotton belting (cotton web), woven asbestos with a wire gauze woven in the asbestos, leather, wood fiber, etc. Copper and brass are satisfactory under some conditions, more especially when the brake is lubricated.

[270]—How would you put a new leather on the cone of a friction clutch?

Remove the old leather carefully and use it as a pattern for cutting out the new one. Trim the new leather to uniform thickness. A harness-maker can do this readily in a suitable machine.

Fasten one end of the new leather in place on the cone with rivets. Wrap the leather around the cone and cut it a quarter of an inch or so short, while holding it in place by hand. Rivet the other end in place. The remaining rivets can now be put in. The leather should fit snugly when pressed into place as the rivets are put in. Copper rivets in deeply counter-sunk holes are suitable.

If the leather is found to be too thick after being put in place, it can be turned down in an ordinary engine lathe (machinist's lathe).

It is not actually necessary for the clutch leather to be all one piece. Two pieces can be used with entire satisfaction. More rivets are required, however.

[271]—How do you adjust a loose bearing of the plain journal type?

Remove one of the shims, if any are used, and tighten the box till it just moves freely on the journals when there is no oil on it. (Shims are thin pieces of metal placed between the cap and body of the box.) It is far better to adjust with a little shake than have a pinching fit.

[272]—How can a cracked casting such as the metal shell around the water-jacket space, or some housing, or casting of the car be repaired?

There are various processes which can be applied according to the conditions of the case. Some of these are brazing, welding with oxy-hydrogen flame, oxy-acetylene flame, etc. Repair can also be made in the foundry in some cases by pouring molten metal against the broken part so as to melt part of it away and fuse the liquid metal into the remainder thus forming a complete piece. Another method is to put sal-ammoniac solution in the crack when the metal is iron or steel. This causes rust, which closes the crack more or less effectively. It may be remembered that sal-ammoniac is used in ordinary dry batteries. This method is a last resort.

It is advisable to consult those who make such repairs as a business.

A cracked water jacket can sometimes be successfully repaired temporarily by rubbing into the crack a cement made from yellow oxide of lead and glycerine, making sure that the latter is free from water.

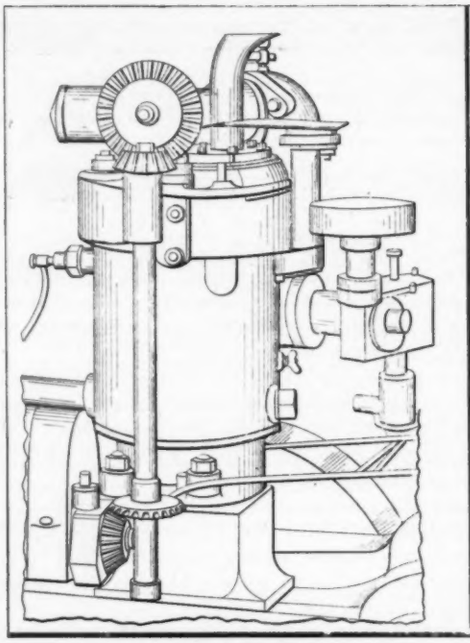


Fig. 1—The Blood disc valve engine

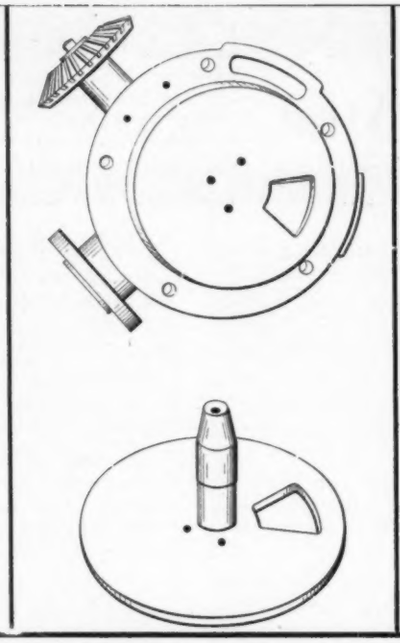


Fig. 2—Showing discs removed

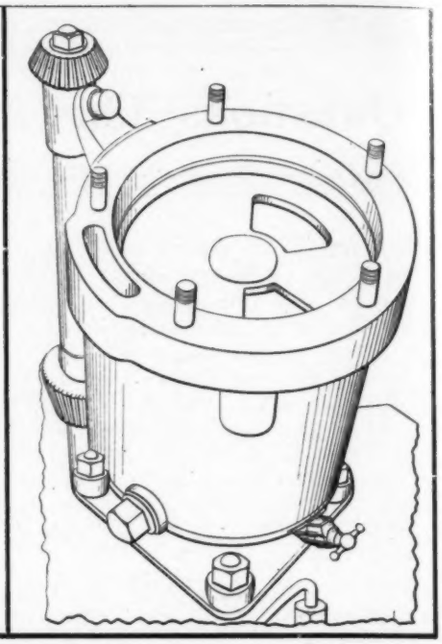


Fig. 3—Cylinder heads removed, showing bolts

Digest

Novel Disc-Valve Motor; Electric Lighting System; and Other Matters of Interest

A new idea in gasoline motors designed by Lieut. Blood appears in the *Automotor,* and an experimental single cylinder with a 4-inch-bore and 4 1-2-inch stroke has been made to demonstrate the principle.

As our illustrations show, the special feature consists of a flat disc having a single port cut through it, this disc fitting between corresponding ports above and beneath, through which the explosive mixture is admitted from the carbureter, and the exhaust gases are allowed to escape to the silencer. The disc is caused to revolve at half the speed of the crankshaft by means of bevel gearing—which could, of course, be replaced by skew gearing—and the disc has a ground face top and bottom, fitting closely upon the cylinder head beneath and the jacketed cylinder cover above.

Dynamo for car lighting—Of late great attention has been paid to the question of supplying illuminant for the car at night and the most favored types are acetylene and electricity. The reason that acetylene has a larger following than electricity is due to the compact form in which it is now put up, the necessity of frequent charging of storage batteries and the attending costliness of this latter operation. A dynamo permanently fitted to the car and driven by it avoids all charging drawbacks and is clean, compact and, if properly handled, always ready for service.

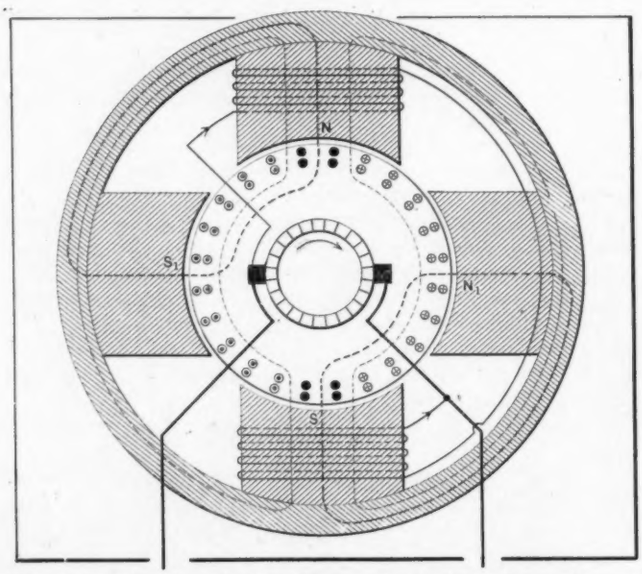


Fig. 7—Section through the dynamo showing the four poles and method of planting inductors in the laminæ of the armature

The dynamo here illustrated, the C. A. V., made by C. A. Vandervell, of Acton, England, has four magnet poles—two ordinary ones N1 and S1 and two subsidiary ones N and S. The latter are excited in the usual manner by means of their windings, but the former are unwound. The armature is drum-wound and the windings are helically staggered, so that those immediately under the subsidiary pole pieces are in communication with the brushes on the commutator ring, and the magnetic flux from their two windings passes diametrically from one subsidiary pole to the other and dividing right and left returns through the frame of the machine as clearly indicated by the dotted lines in Fig. 7.

The collecting brushes are of sufficient width to continually cover two of the commutator sections, and thus they short-circuit certain coils, which are represented in Fig. 7 by eight black dots.

These short-circuited coils instead of being in a neutral magnetic zone as in the case of the ordinary dynamo are situated in a region of great magnetic activity, as they are cutting the lines of force produced by the subsidiary coils N1 and S1. The short-circuit currents produced by these coils "cross magnetize" the armature and set up a magnetic flux at right angles to that of the subsidiary poles, which effect is greatly enhanced by the presence of the unwound ordinary poles.

In consequence of this the previously existing magnetic flux is "distorted" and instead of pursuing the path already traced by these dotted lines and passing from one subsidiary pole to the other through the armature it now passes only halfway through the armature and turns aside, as shown by the thicker dotted lines, thus having a quadrantal path. This change of flow takes place gradually as the speed of the machine begins to rise. While this effect is being accomplished, however, there is another force at work, for the coils of the armature which are not short-circuited are producing current in the usual way, and this is being collected by the brushes and delivered either to the batteries or the lamps as the case may be. Further, this working current has a magnetizing reaction which directly opposes the magnetization

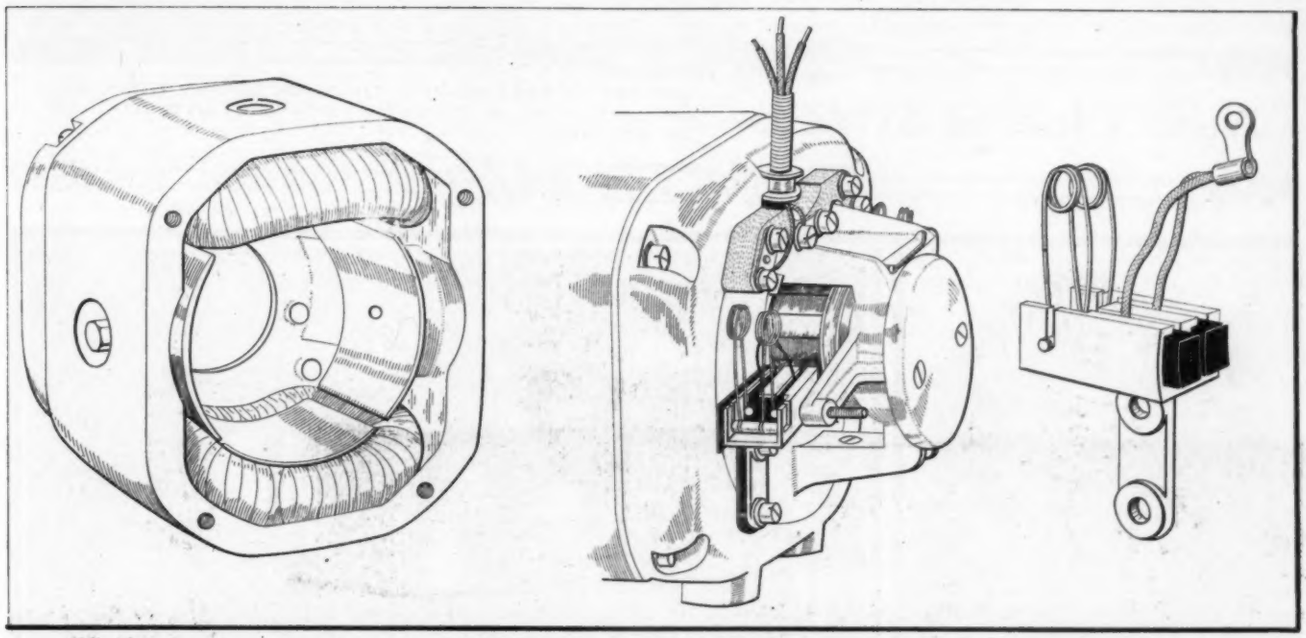


Fig. 4—Field piece with polar extensions. Fig. 5—Commutator end, showing the brushes. Fig. 6—Details of the brushes and holders

of the subsidiary poles, and as the demagnetizing reactions increase proportionally with the speed, the natural tendency of the output of current to increase also with the speed is directly opposed, the result being that there is a constant generation of current.

Three types of C. A. V. dynamos are made; first, 6 volts, 5 amperes, to be driven at from one and a half times to twice engine speed; second, 12 volts, 5 amperes, to be similarly driven; third, 12 volts, 5 amperes, to be driven at engine speed. The first type is suitable for light cars, and especially cabs, for which it seems to be eminently suitable. The dynamo is contained in a dirt, water, oil and dust-proof case, weighing only 16 pounds, and having in larger sizes dimensions of 11 inches x 7 inches x 6 inches can readily be installed on almost any car.

In Fig. 4 is given a sketch showing the disposition of the main and subsidiary poles in the frame, while Fig. 5 is an illustration of the armature end, brushes, etc. The latter are shown in detail in Fig. 6. The brushes themselves are a special grade of carbon and are contained in slides, where they are pushed against the commutator by means of the springs shown. They are connected up to the insulated bridge indicated by dotted shading in Fig. 5, where they are placed in communication with the switchboard through the main cable.

Supplanting Rubber

At Eight Sets per Year Pneumatic Tires Will Have to Go

AUTHENTIC data bearing upon the life of pneumatic tires is difficult to obtain. Just how many sets of tires an automobile will wear out in twelve months depends, of course, upon the sizes used considering the design, power and weight of the automobile; the miles traveled per year must also be figured in, and the character of the roads over which the automobile goes will influence tire life. Then, there is the personal equation to consider, also the skill of the owner, and the extent to which the needs of the tires are looked after. At all events it has been claimed that eight sets of pneumatic tires may be worn out in a single year by an automobile. There is one great compensating factor that must not be forgotten; the tires, not the automobile, wear out. In many attempts to substitute solid for pneumatic tires, the reverse has been true, that is to say, the automobile suffered instead of the tires. The tire that is to put the pneumatic *hors de combat* must last longer than the pneumatic; cost less to the user and not shorten the life of the automobile. Inventors might as well keep these details in mind while they go about the great task.

Aluminum Castings

Strength Depends Upon Thickness and Shape of the Castings

WHEN the strength of aluminum is being investigated it is necessary to take into account the shape and thickness of the casting as well as the mixture and the quality of the work done in the foundry. It is on this account that test proofs attached to the castings do not offer a means of determining the true strength of the metal. As a general proposition the strength of cast aluminum varies as follows with the thickness of the castings:

Thickness in inches	Relative tensile strength in pounds per square inch
0.10	108
0.20	100
0.30	98
0.40	94
0.50	90

In every attempt to eliminate sound by adding to the thickness of the aluminum walls, it is at the expense of strength of the metal as measured in pounds per square inch.

German Automobile Imports and Exports

For the first eight months of the present year up to the end of August the import of cars and parts has shown a slight increase in value over the same period in 1909, the figures for 1910 being $1,927,250, as compared with $1,741,000 in 1909. The exports, however, show a much larger increase. The value of cars and parts exported for the first eight months of this year shows a large increase over last year, the figures up to the end of August, 1910, being $4,897,500, and for the same period of 1909 $1,861,100.

A series of technical dictionaries, on the Scholmann system giving the equivalents of technical terms in English, French, German, Italian, Spanish and Russian, are published by R. Oldenbourg, Munich and Berlin. Whenever practicable the terms are also illustrated in the most universal language; that is, by drawings. The latest volume deals with iron-concrete construction.

Auto Club of Syracuse

HISTORY OF ORGANIZATION THAT HAS GAINED THE NAME OF "LIVE WIRE" BY ITS ACTIVITY IN MANY USEFUL LINES OF MOTORING

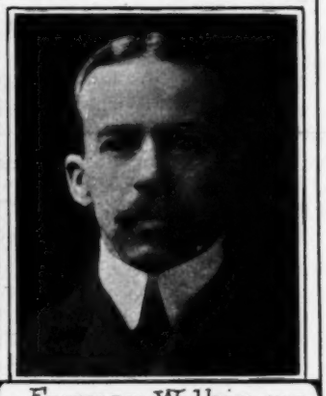
Where Club is Housed

Office of the Club

Dr. C. M. Ryan
2nd V. Pres.

H. W. Smith
Pres.

H. P. Denison
1st V. Pres.



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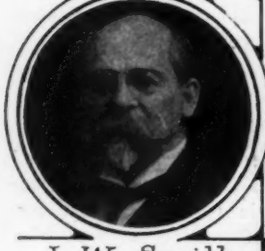

J. W. Smith
Director

A. T. Brown
Director

W. L. Brown
Director

C. C. Bradley Jr.
Director

B. E. Watson
Director

SYRACUSE, N. Y., Nov. 7—There are fifty-seven automobile clubs in the State of New York and there is not one among them which more clearly answers the definition of a "live wire" than does the Automobile Club of Syracuse. It is a club of achievement. Pioneer in the road sign movement now being taken up by clubs all over the country, strongly influential in the making of legislation, standing firmly for the compliance by all drivers with the laws fixed by the community for their control, a potent force for improved highways, putting forth special efforts for the convenience of tourists, the Automobile Club of Syracuse is for the automobile from A to Z.

The club was organized June 12, 1901, T. D. Wilkin being its first president. There were not many more than members enough "for a quorum." The first club run was held that year to Pleasant Beach, a nearby resort.

The club flourished until at the expiration of the term of the second president, Willett L. Brown, there were nearly 100 members.

The Syracuse club organized the New York State Automobile Association, which now has a membership of over 5,000. The club now has a membership of well over 600 and is taking in twenty and thirty at a meeting.

The early meetings of the club were held at The Yates, but with the growth of the organization permanent quarters were required, so some three years ago rooms were secured in the S. & A. K. building and Miss Grace Tickner was placed in charge as office manager.

Three months ago the Automobile Club of Syracuse removed to the Onondaga and has handsome permanent offices therein on the mezzanine floor overlooking the lobby, fitted with mahogany furniture and fixtures, forming a most attractive resort for the tourists who make the Onondaga their headquarters.

The present officers of the club are H. W. Smith, president; H. P. Denison, first vice-president; Dr. C. M. Ryan, second vice-president; Forman Wilkinson, secretary and treasurer, Miss Grace Tickner is office manager. The directors are B. E. Watson, C. C. Bradley, Jr., J. William Smith, A. T. Brown, and W. L. Brown. The club is regularly affiliated with the American Automobile Association as well as with the New York State Automobile Association.

"All roads lead to Syracuse," is the slogan of the club, and the organization has helped in no small degree to make the city the busy center it is. In the aggressive campaign, never-ceasing, that is waged for members, the following reasons are given why men should join the club:

"This club stands for organized opposition to unjust and discriminatory legislation affecting automobile interests; for the improvement of our streets and highways; for the observance of the State automobile law and city vehicle ordinances, and for the furtherance and protection of all legitimate interests of automobile owners."

The club's deeds back up its words all around, and in no field more thoroughly than in that of legislation. From 1906 to 1909 about twenty bills each year, taxing and restricting motor vehicles, were introduced in the State Legislature. If one ran only an electric the passage of the L'Hommedieu bill would have made it cost from $5 to $7 annually in taxes. The New York State Automobile Association, in fighting these measures, had no more spirited member than the Syracuse club. And in 1909 the Syracuse organization was one automobile club in the State that fought to defeat the Allds-Hamm bill, this measure having been favored by the State organization and fifty-seven other clubs. Governor Hughes backed up the Salt town judgment by vetoing the bill.

A work in which the club is profoundly interested is the locating of route and danger signs within a radius of fifty miles around Syracuse. They are being placed north as far as Watertown, south to Cortland, east to Oneida Castle and Richfield Springs and west to Auburn and Weedsport. The Automobile Club of Auburn intends to vigorously prosecute this work next season, just as the Rochester and Buffalo clubs are now doing, following the lead of Syracuse.

The signs are made to last, being composed of sheet steel, enameled in white with dark blue letters. Besides route and distance signs, there are "dangerous hill," "danger," "railroad and trolley crossing" signs. "Gasoline for sale here" signs are now being distributed through the countryside for tourists' convenience, and everything is marked as erected by the Syracuse club.

In 1909 over 600 road signs were placed. This year there were over 700. The club now employs two or three men constantly in placing these signs. It has been the ambition of the club in this sign work to so wholly post Syracuse and environs that tourists will need to visit the club headquarters merely for a social call. And this ambition is being realized.

The club has taken the liveliest interest in the good roads movement. Last year among other donations, it raised $350 to help complete repairs to Free Bridge at Cayuga Lake.

The club is, first and foremost, a business organization, and the social part comes later, though there are delightful times at the banquets which are held at the annual meetings. For a long time the organization had too much business afoot to hold club runs, but a new era was established in July of this year, when the sociability run for the B. E. Watson trophy was held to Rexford Falls and return. Nearly a hundred machines participated and such a success was it that it was determined to repeat it next year.

Since its inception the Syracuse club has had annually an "orphans' day," when the little inmates of city institutions for the parentless have been taken upon enjoyable outings.

In January of this year the club started its official monthly paper, *The Spark Plug*, a snappy publication that is flourishing.

The Syracuse club has had a lot to do with the success of the two shows the Syracuse Automobile Dealers' Association has held and has lent its efforts toward this end without stint.

There are two road signs prominently shown through this section which are positively unique and Secretary Wilkinson is the "composer." Both are signed by the club. One, at the entrance of a town, on all the main highways, reads, "Please drive carefully through this town." At the exit of the town the autoist is confronted with a pleasant "Thank you."

All in all a "Live-Wire" club like that of Syracuse is worth infinitely more than all the dead ones that ever died. For had they been like that of Syracuse they wouldn't have died.

Coming Events

CALENDAR OF FUTURE HAPPENINGS IN THE AUTOMOBILE WORLD THAT WILL HELP THE READER KEEP HIS DATES STRAIGHT—SHOWS, RACES, HILL-CLIMBS, ETC.

Nov. 19-26.....Oakland, Cal., Idora Park Show, Under Management of Oakland Automobile Dealers' Association.

Dec. 1.....Chicago, Ill., First Annual Aeronautical Exhibition in the Coliseum.

Dec. 31-Jan. 7, '11.New York City, Grand Central Palace, Eleventh Annual International Automobile Show.

Jan. 7-14, 1911...New York City, Madison Square Garden, Eleventh Annual Show, Pleasure Car Division, Association of Licensed Manufacturers.

Jan. 14-28, 1911..Philadelphia, Annual Show, Philadelphia Licensed Automobile Dealers' Association, Third Regiment Armory.

Jan. 15-21, 1911..Detroit, Wayne Gardens, Detroit Automobile Dealers' Association.

Jan. 16-21, 1911...New York City, Madison Square Garden, Eleventh Annual Show, Commercial Division, A. L. A. M.

Jan. 28-Feb. 4,'11.Chicago Coliseum, Tenth Annual National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Pleasure Cars and Accessories, Exclusively.

Feb. 6-Feb. 11,'11.Chicago Coliseum, Tenth National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Commercial Vehicles, Pleasure Cars, Motorcycles and Accessories.

Feb. 24-27.....New Orleans, La., Annual Show, New Orleans Automobile Club.

Mch. 4-11, 1911...Boston, Mechanics' Building, Ninth Annual Show, Licensed Automobile Dealers' Association.

Mar. 25-April 1..Buffalo, N. Y., Fourth Power Boat and Sportsmen's Show, Sixty-fifth Regiment Arsenal, Buffalo Launch Club.

Mch. 25-Apr. 8....Pittsburg, Annual Show, First week, pleasure cars; second week, commercial trucks. Automobile Dealers' Association of Pittsburg, Inc.

Races, Hill-Climbs, Etc.

Nov. 7-11.....Five-day Reliability Run of Chicago Motor Club, 200 Miles a Day.

Nov. 10-12-13.....San Antonio, Tex., Track Meet.

Nov. 11-12.....Savannah, Ga., Road Race, Savannah Automobile Club, and Grand Prix, Automobile Club of America.

THE AUTOMOBILE

Vol. XXIII Thursday, November 10, 1910 No. 19

THE CLASS JOURNAL COMPANY
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231-241 West 39th Street, New York City

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Long Distance Telephone - - - - - - - - - - 2046 Bryant, New York

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Other Countries in Postal Union, including Canada - - - - One Year, 5.00
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FOREIGN SUBSCRIPTION AGENTS
ENGLAND:—W. H. Smith & Sons, Ltd., 186 Strand, London, W. C., and all bookstalls and agencies in Great Britain; also in Paris at 248 Rue de Rivoli.
FRANCE:—L. Baudry de Saunier, offices of "Omnia," 20 Rue Duret, Avenue de la Grande Armee, Paris.
GERMANY:—A. Seydel, Mohrenstrasse 9, Berlin.

Entered at New York, N. Y., as second-class matter.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

TEACHING the automobilist how to take care of his tires, in view of the cost to him if he fails to do so on his own account, would seem to be like carrying coals to Newcastle. Unfortunately, there resides in the tire situation a complex problem, the nature of which remains to be understood; nor can it be claimed that those who should know most about the situation are taking overmuch time in the exposé of the same. If a task is to be performed, and it remains undone, despite a pressing necessity, the natural inference is that the master of the job is as yet in the coming. In the meantime, rather than to float with the tide, it would seem to be a better plan to struggle with the "beast," with the expectation that if he cannot be mastered, he may be winded. THE AUTOMOBILE makes a special effort this week, opening up a new line of thought and presenting to the owner a system for the investigation of his tires that will help him to arrive at fitting conclusions from time to time, and permit him to locate defects in the tread long before they would be noticeable, as a matter of direct observation. The imprint method of investigating the condition of tires requires nothing more than a few strips of paper, a modicum of Prussian blue, and a little time.

* * *

OWNERS of automobiles make a great mistake when they assume that articles in a technical paper are too technical for them to bother with. The word "technical" is much abused. Its proper definition should be given as follows: "A terse explanation of the use of a mechanism." Much of the matter that passes current as "technical literature" is, of course, a mere jumble of meaningless words; they being valueless, the author attempts to bolster them up by the application of algebraic formulæ, and it is no wonder that those who are busy enough making their automobiles go decline to waste any time upon "word jumbles"; but when technical literature, so-called, is limited to a clear and understandable statement of the underlying facts, the man who desires to limit the cost of operating his automobile can well afford to throw his prejudice away and exercise his common sense. Every fact ceases to have a technical significance as soon as it is generally understood; the only reason why it is regarded as technical is because its proper understanding is not broadly disseminated. There is no more simple way of describing a thing than to clearly state the object of its existence, how it is made, and how it must be operated to obtain the good there is in it. If this is technical literature—and it must be—it remains for the automobilist to expend a dollar's worth of time reading it, so that he can save himself a thousand dollars'.

* * *

WHAT is speed? History proves that when security is realized to the fullest extent, the question of speed dies out. Four thousand years B.C., when men were prancing around on "Shank's mares," the first war chariot was an adequate illustration of speed in the absence of security. It was not a case of the chariot going very fast so much as it represented the inability of men to get out of the way. A few years ago when horse-cars were relegated to the scrap pile, and the "trolley-car" came into vogue, there was ample evidence of speed without security. To-day there is hardly a man who would consider himself as doing anything but wasting time were he to utilize the services of a trolley-car when within striking distance of a subway train. When the automobile first attracted the notice of the public and racing cars made the excellent speed of 20 miles per hour, the public at large persisted in the belief that a racing driver would have to keep his mouth closed, on the ground that if he opened it the wind pressure would be so great that he would not be able to close it again. Racing drivers have since discovered that they have good control of their facial muscles when riding at something like a mile in 28 seconds. In the meantime, there is scarcely a citizen in America who would not invite an automobile to whip up the speed were it traveling at any pace under 20 miles per hour. When the whole situation is adequately canvassed, the conclusion is reached that speed with safety is not a fixed quantity. Safety comes with the better understanding of the public, and the perfection of the braking mechanisms, so that speed may be notched up from time to time as the public learns how to "step lively," and the controlling systems employed show greater capabilities.

* * *

"STAND-PATTERS," those who are in favor of "automobile legislation" of the character of which the Callan Law is a working specimen, also the type of Law that the automobilists of the State of New Jersey groan under, may now go to grass. The automobilists who have heretofore trusted their "good friends" (who also make a good living out of it) are wearied of "framed" legislation. What the situation demands is honest treatment; nor is it to be supposed that honesty, cut on the bias, will suffice.

Standardization Work

Iron and Steel Division of S. A. E. Committee on Standards Meets and Fixes Specifications; Division on Pyrometers to Meet; Aluminum and Copper Alloys to be Considered Soon

IRON and Steel Division of the Standards Committee of the Society of Automobile Engineers met last week at the offices of the Society, 1451 Broadway, New York, the following being present: Howard E. Coffin, president of the society; Henry Souther, W. P. Barba, E. L. French, M. T. Lothrop and Coker F. Clarkson, secretary.

The division took up consideration of the specifications for materials for automobile construction. As a result of the meeting, the standard form of specimen used in testing automobile materials will probably be changed; and instructions as to the use of the test-specimens and testing machines will be issued.

Specifications for recommendation to the society, of the following steels and irons were taken up in detail and acted upon: .15 carbon steel, .25 carbon steel, .45 carbon steel, .80 and .95 carbon steel (primarily for springs), .20 carbon 3 1-2 per cent. nickel steel, .30 carbon 3 1-2 per cent. nickel steel, .30 carbon chrome nickel steel, .20 carbon chrome nickel steel, .45 carbon chrome nickel steel, .15 carbon chrome nickel steel, .20 carbon chrome vanadium steel (primarily for case-hardening), .45 carbon chrome vanadium steel, silico-manganese steel, valve metals, steel castings, gray iron castings, malleable iron.

The following points will be considered at the next meeting of this division: pyrometer and heat control; description and definition of heat-treatments. tabulation of physical results of heat treatments.

A standard order of statement of the different elements in the metals will be recommended, something as follows: (1) carbon, (2) manganese, (3) silicon, (4) phosphorus, (5) sulphur, (6) chromium, (7) vanadium. The elements are now given in the forms of various laboratories and mills in many different ways, and standardization will eliminate much confusion and loss of time.

This week two other divisions of the S. A. E. standards committee are holding meetings at the Society's office. These divisions are those on aluminum and copper alloys, constituted of F. W. Cooke, Thomas J. Fay, George M. Holley, Wm. H. Barr, H. W. Gillett, J. J. Aull, Geo. W. Dunham, R. S Fretz, and S. P. Wetherill, Jr.; and on plain, ball and roller bearings constituted of H. W. Alden, David Fergusson, W. P. Kennedy, A. P. Sloan, Jr., W. A. Frederick, Henry Hess, Elwood Haynes, A. L. Riker and Howard Marmon.

Steel Corporation Moves Up

American Patent Rights of the Héroult Process for Electrically Refining Steel Purchased

WHEN the question of the electric refining of steel was first broached as a scientific possibility, those who devote themselves to commercial work said that it was a laboratory trinket with the remotest, if any, commercial possibility. In the course of time the Héroult process of steel-making was perfected abroad, and in the last few years electrically refined steel has been taking the place of crucible steel for the better class of work, and with a better understanding of the questions of cost, and the possibilities of the electric furnace, commercial steel makers have revamped their views to a mervelous extent. It was in the Spring of 1896 that real practical work began in some of the German mills involving the electric furnace, and we now learn that the United States Steel Corporation has just purchased the American patent rights of the Héroult process, although it is fair to state that electric furnaces are in use at the present time at the Gary plant of the steel corporation. Some of the notable advantages of the electric furnace in steel making were pointed out in THE AUTOMOBILE from time to time, and of late the evidences indicating the fine quality of this fabric have been so overwhelming that those who watched the questions of quality of material were constrained to believe that something should be done in America in order that it would be possible to keep abreast of the progress that is being made in foreign lands. The purchase of the Héroult patent rights and the introduction of this successful system of steel refining represent a distinct inclination on the part of American steel fabricators to keep pace with the times unless perchance the patent papers are filed away in a stout safe and electrically refined steel by this process, if it is to be had at all, must be imported from Germany.

A.L.A.M. Meeting

Col. Charles Clifton Enters on Seventh Annual Term as President of Association of Licensed Automobile Manufacturers

COL. CHARLES CLIFTON, who has served the A. L. A. M. as its chief executive for six terms, was unanimously re-elected to that office at the annual meeting of the association Thursday. All the other officers were re-elected as follows:

S. T. Davis, Jr., vice-president; L. H. Kittredge, secretary; George Pope, treasurer, and Alfred Reeves, general manager.

The Executive Committee is composed of the following: Charles Clifton, S. T. Davis, Jr., Thomas Henderson, Hugh Chalmers and Herbert Lloyd.

The Association Patents Company, a subsidiary of the A. L. A. M., chose the following officers: Charles Clifton, president; Thomas Henderson, vice-president and Alfred Reeves, secretary and treasurer.

Reports read at the meeting showed that trade during the past year has been 100 per cent. greater than it was in the preceding year. Conservatism in manufacture is to be the keynote of 1911, according to the association.

A resolution was passed to have the Licensed Dealers' Association of New York co-operate and affiliate with the manufacturers in the National Automobile shows in future.

The meeting was the largest yearly gathering of the organization ever held, forty-three members being present as follows: James Joyce, American Locomotive Co.; John S. Clarke, Autocar Co.; O. Y. Bartholomew, Bartholomew Co.; Frank Briscoe, Brush Runabout Co.; G. A. Lambert, Buckeye Mfg. Co.; W. C. Leland, Cadillac Motor Car Co.; C. C. Hildebrand, Chalmers Motor Co.; H. W. Nuckols and Herbert Lloyd, Columbia Motor Car Co.; M. S. Hart, Corbin Motor Vehicle Corp.; C. G. Stoddard, Dayton Motor Car Co.; B. A. Becker, Elmore Mfg. Co.; G. H. Stilwell, H. H. Franklin Mfg. Co.; E. H. Broadwell, Hudson Motor Car Co.; G. A. Matthews, Jackson Automobile Co.; Alfred N. Mayo, Knox Automobile Co.; S. T. Davis, Jr., Locomobile Co. of America; H. A. Lozier, Lozier Motor Co.; F. F. Matheson, Matheson Motor Car Co.; Horace DeLisser, Maxwell-Briscoe Motor Co.; Wm. T. White, Mercer Automobile Co.; Wm. E. Metzger, Metzger Motor Car Co.; Rufus Walker, Jr., Moline Automobile Co.; Geo. M. Dickson, National Motor Vehicle Co.; C. C. Hanch, Nordyke & Marmon Co.; M. J. Budlong, Packard Motor Car Co.; L. H. Kittredge, Peerless Motor Car Co.; Charles Clifton, Pierce-Arrow Motor Car Co.; George Pope and A. L. Pope, Pope Mfg. Co.; H. O. Smith, Premier Motor Mfg. Co.; R. E. Olds and R. W. Owen, Reo Motor Car Co.; Geo. J. Dunham, Royal Tourist Car Co.; G. E. Mitchell, Alden Sampson Mfg. Co.; R. H. Salmons, Selden Motor Vehicle Co.; F. B. Stearns, F. B. Stearns Co.; Wm. R. Innis, Studebaker Automobile Co.; W. White, Waltham Mfg. Co.; John N. Willys and Geo. Bennett, Willys-Overland Co.; Thomas Henderson, Winton Motor Carriage Co.; Alfred Reeves, general manager.

S. A. E. Growing

Society Elects 22 Members at Meeting held recently

THE following were elected, last week, members, associates and juniors of the Society of Automobile Engineers:

Ludlow B. Alexander, Bosch Magneto Co., New York City
Clement Booth, Standard Roller Bearing Co., Philadelphia, Pa.
Arthur Clayden, Editor "The Automobile Engineer."
Clarence H. Froelich, Velie Motor Vehicle Co., Moline, Ill.
J. H. Gould, McCord Mfg. Co., Detroit, Mich.
Julian A. Halford, W. A. Wood Auto Mfg. Co., Kingston, N. Y.
Robert Jardine, Royal Tourist Car Co., Cleveland, O.
Frank M. Stinson, Locomobile Co. of America, Bridgeport, Conn.
Walter Wardrop, Editor "Power Wagon," Chicago, Ill.
Henry A. Bugio, Philadelphia Steel & Forge Co., New York.
Victor W. Kliesrath, Bosch Magneto Co., New York City.
Charles E. Lozier, Columbia Steel Co., Elyria, O.
Hugo C. Mootz, Ohio Motor Car Co., Cincinnati, O.
Joseph W. MacKay, Wetherill Finished Castings Co., Philadelphia, Pa.
Francis Miller, Bellevue, Campbell Co., Kentucky.
Carl E. Pearson, National Coil Co., Lansing, Mich.
Milton Rupert, R. D. Nuttall Co., Pittsburg, Pa.
Robert Skemp, American Sheet & Tin Plate Co., Pittsburg, Pa.
Arthur Brandes, Ohio Motor Car Co., Cincinnati, O.
Lee H. Hazard, Velie Motor Vehicle Co., Moline, Ill.
Arthur L. Myers, McCord Mfg. Co., Detroit, Mich.
Lawrence R. Moran, Hudson Motor Car Co., Detroit, Mich.

Few Penalties in Chicago Run

29 Starters In C. M. C.'s 1000-Mile Contest

MOLINE, ILL., Nov. 7—The first day of the Chicago Motor Club's 1,000-mile reliability, which started from Chicago this morning, brought about the penalization of three cars out of the twenty-nine that started. Lewis Strang, in the Case, drew fifty points because a pin sheared off the magneto coupling. Randall in one of the two Hupmobiles got one point for a carbureter adjustment and Brown in No. 1, Abbott, was penalized three points for adjusting a push rod.

Considerable tire trouble was experienced. The roads in the main were good. To-day's run was 193 miles, and to-morrow's will be 205 miles with the night stop at Quincy. Score to date:

1—Abbott-Detroit	Brown	3 points
2—Haynes	Irby	Perfect
4—Cunningham	Emery	Perfect
6—Halladay	Daubner	Perfect
7—Haynes	Williams	Perfect
8—Henry	Padley	Perfect
9—Imperial	McKersher	Perfect
10—Glide	Cassell	Perfect
11—Abbott-Detroit	Robins	Perfect
12—Cino	Donnelly	Perfect

IN THE ROADSTER CLASS

100—Falcar	Vansicklen	Perfect
101—Midland	Nulling	Perfect
102—Grout	Hallser	Perfect
103—Hupmobile	Randall	1 point
104—Moline	Vandervoort	Perfect
105—Lion	Bloomstrom	Perfect
106—Moline	Wycke	Perfect
107—Case	Jones	Perfect
108—Imperial	Wells	Perfect
110—Speedwell	La Chappelle	Perfect
111—Halladay	Caument	Perfect
112—Staver	Montclamier	Perfect
113—Staver	Dulf	Perfect
114—Case	Strang	50 points
115—Krit	Hambermicht	Perfect
116—Brush	Lincoln	Perfect
117—Haynes	Wagner	Perfect
118—Hupmobile	Hearn	Perfect
119—Moline	Salisbury	Perfect

In the October 6 issue of THE AUTOMOBILE it was stated that the Model O Pullman is equipped with 34 by 4 tires. The correct size of tires used in that model is 34 by 3 1-2.

Short News of Interest

—The American Motor Sales Company, Erie, Pa., has secured the agency for the "Thomas Flyer" in that territory.

—An agency for the Cartercar has been opened in Philadelphia. The Johnston Motor Car Co., 326 N. Broad street, secured the agency.

—James C. Clinton, of Detroit, has been appointed manager of the Louisville branch of the Studebaker Automobile Co. He succeeds Daniel T. Patton, who resigned.

—The Liberty Automobile Tire & Supply Company, of Pittsburg, has secured Earley Singel, formerly of the H. H. Franklin Company, of Syracuse, N. Y., for general manager.

—The Roy Thompson Automobile Company, 122 East Seventh street, Cincinnati, distributers of Warren-Detroit automobiles, will move soon to 117 East Seventh street and will open a repair shop.

—Recent incorporations of interest to the automobile world are: Detroit Metal Forming Company, $25,000; Bennett Axle & Transmission Company, $150,000; Auto Brass Manufacturing Company, $6,000.

—At the annual meeting of the Louisville Automobile Dealers' Association the following officers were elected: Prince Wells, president; E. G. Reimers, vice-president; Hubert Levy, secretary and treasurer.

—T. A. Davies and Harry W. Smith have taken the agency for the Lozier car in Seattle. C. S. Cummings, until recently manager of the Metropolitan Motor Car Co., will be associated with them in an advisory capacity.

—H. T. Boulden, of the Franklin Agency, in Cincinnati, has been appointed district manager for the Franklin Company. Mr. Boulden will have supervision of all the Franklin agencies in Southern Ohio, Indiana, Kentucky and Tennessee.

—Gimbel Brothers' New York establishment has installed a system of electric delivery and transfer trucks, including thirty-six of the former type and thirty of the latter. The cars are all Studebakers equipped with Westinghouse motors.

—The E. J. Welch Auto Co. of Fitchburg, Mass., is about to open a new garage. The building is two stories, fireproof, and has floor space of 15,000 square feet. The company will handle several cars and a full line of parts and accessories.

—The Firestone Tire and Rubber Co. has issued a booklet covering full instructions as to the use of its quick detachable and demountable rims. The booklet is illustrated with numerous cuts to show each step in the process.

—The H. J. Koehler Sporting Goods Company, distributors of the Hupmobile in New York State east of Buffalo and throughout New England, will open December 1 a salesrooms in Boston at 1074 Boylston street. The new branch is to be managed by W. H. Shutt.

Receivership to End

Creditors Petition Court to Sell Matheson M. C. Co. to Matheson Auto Co.

THE receivership under which the Matheson Motor Car Co. has been operated since last July is likely to be raised on Saturday, when a petition in which more than 90 per cent. of the creditors of the concern have joined to sell it in bulk to the Matheson Automobile Co. of New York is returnable to the Circuit Court of Luzerne County, Pa.

Should the court entertain the petition and grant it, the receivership would terminate automatically, as the subject-matter would pass into the hands of an operating company.

BRIEF ITEMS CULLED HERE AND THERE FOR QUICK READING—INTERESTING ALIKE TO MAKER AND USER

—N. H. Miniter, formerly of the Factory Sales Corporation and the Eiseman Magneto Company, has been appointed special factory representative of the Stromberg Motor Devices Company at Chicago.

—The Cumback Motor Company, of Detroit, has been incorporated with a capital stock of $100,000. R. A. Bailey is president and treasurer; R. O. Cumback, vice-president and manager, and W. S. Bailey, secretary. The company will manufacture a light delivery truck of 1,000 pounds capacity.

—W. E. Roby, who has been connected with the tire business in Minneapolis since automobiles have become a prominent factor in Minneapolis' life, has made known his intention of retiring from the Diamond Rubber Company's Minneapolis branch. The change will take effect January 1, 1911.

—The Findlay Motor Company of Findlay, Ohio, gave a reception Friday at the factory which the people of Findlay and adjacent cities attended in considerable numbers. The first of the Ewing motor trucks made by the company was on display. The car was the same that will be shown at the Palace show in New York.

—The Avery Company, Peoria, Ill., makers of the Avery truck, tractors and other agricultural machinery, has completed an addition to its plant, comprising two buildings, aggregating over 1000 feet in length and 200 feet wide and two stories or more in height. These buildings are designed for machine shops and new machinery is now being installed.

—The Marshall Oil Co., Marshalltown, Iowa, have just taken possession of their new office building, which is one of the finest of its kind in Iowa. The building is of pressed brick, with stone trimming; two stories in height, and so arranged that every desk has ample sunlight and every modern convenience. The company puts out the French Auto Oil and other brands.

—The Thomas high gear car which recently completed a 2000 mile trip through the East, with all the transmission gears eliminated with the exception of the high and reverse, started as a non-competing car in the big 1000 mile reliability contest of the Chicago Automobile Club. The car was used to carry press representatives and members of the Technical Committee.

—The highway between Fairmount and Camillus, N. Y., which has been closed the greater part of the Summer, is now open to automobilists, affording a splendid macadam drive all the way to Auburn. It has been announced that just east of Chittenango a new road on the Genesee turnpike will be opened at once, this being the natural course for tourists going east.

A. M. C. M. E. A. Show

Eight Companies Added to List of Exhibitors; Fifty in All Now on the List

EIGHT additional motor car companies signed contracts during the past week for space to exhibit at the A. M. C. M. E. A. show at the Palace, Dec. 31 to Jan. 7. The list includes the following: C. Baeder Co., New York agents for the Lexington Motor Car Co.; Crawford Automobile Co., Cunningham Sons and Co., Coleman Motor Car Co., C. W. Kelsey Mfg. Co., Oliver Motor Car Co., Victor Motor Truck Co., Roader Car Co.

The total list to date consists of 50 concerns. Active preparations to arrange the building for the exhibition are being carried on and a comprehensive scheme of decoration has been adopted. The promoters announce that about a dozen more manufacturers have agreed to participate but their contracts have not reached headquarters as yet.

Garden Being Fixed Up

100,000 Feet of Floor Space Barely Sufficient for 83 Members and Accessory Makers

NEVER before since the big automobile shows began to be held in the Garden was there so much space available for exhibition purposes as for the forthcoming show. Nevertheless, every inch of the 100,000 feet has been allotted. The preparatory work for the big show is progressing rapidly. Even those most familiar with the old Garden and its multitude of exhibitions will be amazed at the wondrous transformation. Several months ago contracts for the steel construction, which will be equal to that of a good-size building, were given out together with other contracts for decorating, sign-making, carpenter work, etc. The skeleton steel construction will be erected entirely independent of support from the walls of the Garden. Only the wood floors of the galleries and crossbeams will be connected with its walls. The big steel girders which will support the galleries will rest on forty grillages, of steel and concrete. Each grillage will uphold a load of forty tons. These grillages were laid under the floor of the big show building last summer to allow the concrete sufficient time to mature. In all more than 200 tons of steel will be used. If stood on end, one on top of another, the steel columns would reach an altitude of 2,000 feet. One hundred thousand feet of lumber will be used in the construction throughout the building. Two monster freight elevators will be erected to hoist the cars to the galleries.

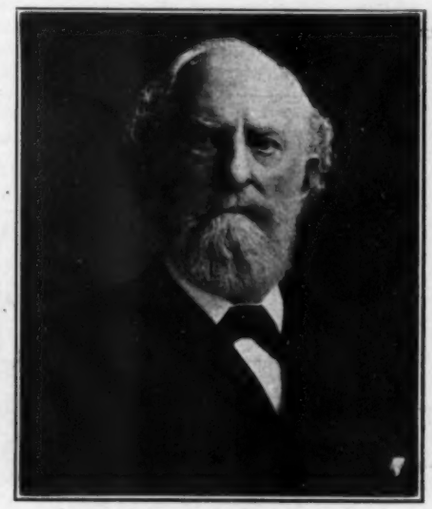
Importers in A. L. A. M.

Licenses granted to Daimler and Hotchkiss Import Companies and Morgan Truck

LICENSE under the Selden patent has been granted to the Daimler Import Co., of New York, the concern that brings in the Mercedes car. Similar action has also been taken by the A. L. A. M. with regard to the Hotchkiss Import Co., which handles the Hotchkiss, and to the R. L. Morgan Co. of Worcester, Mass., manufacturers of trucks.

Corbin, Captain of Industry, Passes Away

Philip Corbin, president of the American Hardware Corporation of New Britain, Conn., died at his home Nov. 3, aged 86. Mr. Corbin was intimately associated in every progressive line of endeavor of New Britain and was the founder of the Corbin Motor Vehicle Corporation, among a dozen other large enterprises. Of late years he had not taken an active part in the administration of any of the companies he fostered except the hardware concern. He was a native of Connecticuit and worked his way from the station of farm hand to the position of a captain of industry through his earnestness, persistence and ability. The funeral was held Monday, during the hours of which business was practically suspended in New Britain.



The late Philip Corbin

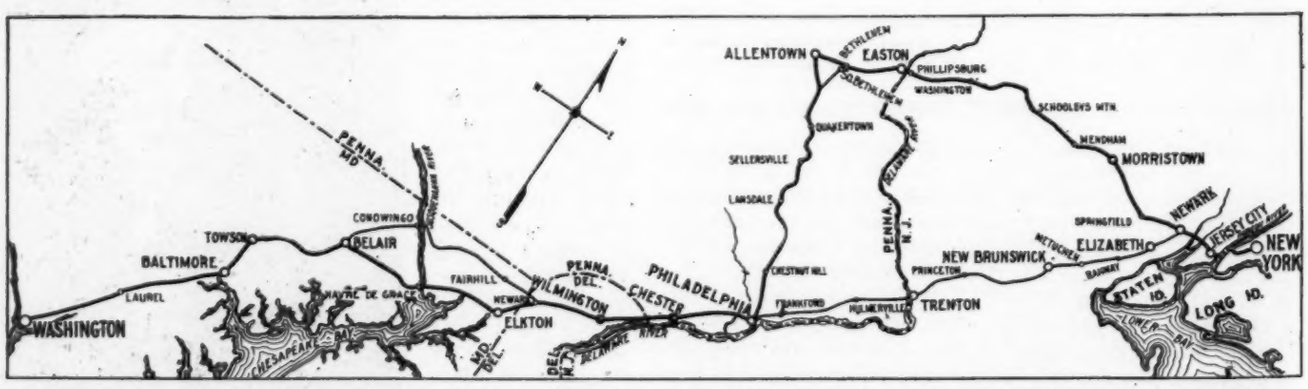
From Metropolis to Capitol

BY HENRY MACNAIR—NEWS OF THE ROAD, AND THOUGHTS INSPIRED BY A RECENT MOTOR JOURNEY

TRAVEL by automobile without accelerating one's think-motor to a correlative speed is like trying to take a snapshot on a wet plate—one gets merely light-struck, so to speak, and carries away no sharp, clean-cut picture of the things worth seeing along the way. Most of us from environment or heredity or want of propelling force have not reached the dry-plate stage, where we are capacitated to receive impressions when traveling at focal-plane speed, yet the introduction of the hand-book or "Baedeker" feature into The Automobile Blue Block has not been made without hope of appeal to the mental wet-plates of the tonneau. Not only should this feature prove of great interest to the ever-increasing multitude of motor tourists but it will be a "first aid" to those who wish to prepare their mental films to a high degree of sensitiveness before venturing among unfamiliar sights and scenes.

Among the interesting trips which will be featured in next year's Blue Book is that from New York to Washington. There is much of interest to be seen in the journey, if one can forget the unfriendly stretches of bumpy roads beyond "Mason and Dixon's Line." Presuming that time is not a factor, Philadelphia is approached in a rather roundabout way, in order to get the best of everything. Leaving via Twenty-third street ferry we pass through Jersey City and across the "meadows" of marsh and sedge grass into Newark. The few blocks of cobblestone—the *bête noir* of city travel—are soon passed and we are on a stretch of macadam which leads through Morristown, where the immortal George spent the winter of '79, and all the way over picturesque hills and along winding brooks to the Delaware. Part of this road is brand new and is finished in the most approved style of the road builder's art. At the forks of the Delaware river we cross a toll bridge (not forgetting that our New Jersey numbers are good only in New Jersey) and enter Easton, which is the site of Lafayette College and a manufacturing center. The visitor's interest will be further aroused at Bethlehem, an ancient Moravian village settled by Count Zinzendorf in 1740. A swing around the city past the old academy and church buildings is of interest and also a side trip across the Lehigh to South Bethlehem where Charles M. Schwab's Bethlehem Steel Company has its magnificent plant. In Allentown, a few miles on, is a monument commemorating the saving of the old Liberty Bell.

Philadelphia, the Quaker City, next invites our attention, but regrettably is one of the few American cities whose hotels hold out no welcoming hand to visiting motorists. It rests its claim for notability, among other things, on its Independence Hall, where rests the Old Liberty Bell, and on its glorious Fairmount Park. Our route out of the city is over the Schuylkill and out to Darby over some very much neglected streets with never a sign to welcome the coming or speed the parting motor guest. When the smooth road is finally reached the keen edge of enjoyment is dulled by the mile-apart toll-gates reaching to Wilmington, where we cross the historic Brandywine. Here is the famous Dupont Powder Works, and here, too, the old Swede's Church dating from 1698, recalling the first Swedish colony in America. From Wilmington magnificent macadam stretches to Newark, where Delaware, more progressive than Pennsylvania or Maryland, permits the wayfarer to go untaxed. Just beyond Newark we cross the "Mason and Dixon's Line," and at the gateway of the South we are welcomed by the worst 20-mile stretch of our journey, which, we were told, is "very bad when wet and worse when dry." Fortunately we encountered it when at its best, being neither too wet nor too dry, but nevertheless breathed a sigh of relief when the mighty Susquehanna came in view. Crossing on a transformed railway bridge with a heavy enough toll ($1) to make us appreciate its worth, we enter Havre de Grace and enjoy the best meal of our trip at a little inn, whose modest charge of 50 cents warms the cockles of our heart toward the man who has not put up his prices on the long-suffering motorist. By leaving the Old Pike at a village called "Fork," we take a pretty "valley road" to Towson, and thence on the inevitable toll-road into Baltimore, whose distinctive features are its Washington Monument, the residence of Cardinal Gibbons and Johns Hopkins University, ranking with the universities of the Old World. Baltimore has an unbroken record of peace, having been only threatened by attack during the Revolution and lying outside of the theater of combat during the Civil War. On the other side of the scales is the memorable conflagration of 1904, which devastated an area of 150 acres and caused a property loss of $17,000,000. Baltimore, of course, has its churches, its parks, its libraries and its manufactures, but it would take days to explore its list of interesting points. We, therefore, leave its old monument in our rear and take a circuitous route, necessitated by street conditions, to Relay. Only five miles of jouncy road mars our trip as we pass through some quaint old villages into Washington, where we circle the Capitol and go up Pennsylvania Avenue to the "White House," the real center of things Washingtonian, though, of course, L'Enfant laid out his splendid network of broad driveways with the Capitol as a center. However, Washington is another story, and after a rest at the really good hotel of the city, the tourist will be ready to explore its many points of beauty and historical interest.



Map of the route "From Metropolis to Capitol," crossing four states, also showing direct New York-Philadelphia connection

Among the Makers

JOHN W. STODDARD COMMANDS APPRECIATION OF EMPLOYEES; PHILADELPHIA GETS AN ELECTRIC COMPETITION; MANGANESE SERVES A VERY IMPORTANT PURPOSE

DAYTON, O., Nov. 7—John W. Stoddard, who recently retired from the presidency of the Dayton Motor Car Company, was presented with an ornate bronze tablet by the employees of the three factories comprised in the plant as an appreciation of his kindly relations with them for many years.

The presentation was made by Superintendent R. Thurston Houk and came as a surprise to Mr. Stoddard. The tablet contains a relief bust of Mr. Stoddard surrounded with appropriate symbols illustrating the various stages of his career; commencing with law books, running through agricultural implements and being completed with a touring car.

The tablet is inscribed "Presented to John W. Stoddard by

Tablet presented to John W. Stoddard, founder of Dayton Motor Car Company, by his employees

the factory employees of the Dayton Motor Car Company in appreciation of his long years as a considerate employer and in recognition of those sterling qualities which have made him admired by all men."

Electrics to Run

Philadelphia "North American" Promotes Unique Competition

GRACEFULLY and quietly, after the order of electric automobiles, a column of about fifty contesting cars will leave from in front of the Philadelphia *North American* Building at 10 o'clock Friday morning for a tour of the streets of the Quaker City, comprising about 50 miles.

The run is the first ever staged for electric pleasure cars and will be conducted by the Quaker City Motor Club racing officials. The contest will have the roadability feature of secret time devised by Harry C. Harbach, secretary of the club. The referee will be R. E. Ross, chairman of the contest committee of the club, who has acted as referee in the Fairmount Park road race and other important sporting events. G. Hilton Gantert will start the cars and Paul B. Huyette will have charge of the timing.

No entrance fee is charged and the *North American* has offered two prizes, plates costing $150 each, for the cars most closely approximating the secret time. One of the prizes will be given to the male driver and the other to the woman driver who come closest to the time selected. It is expected that a dozen or more women will enter the competition, as half a dozen of them have up to this time stated their intention to drive cars in the contest, the driving of electrics being a popular pastime among Quaker City's ladies.

The course will be through the streets of the city and will take in some of the suburbs. From Broad street the way selected lies through Fairmount Park, Ardmore, Bryn Mawr and return by a different route.

The secret time will be determined by the contestants themselves. Each will write a time upon his starting card when given the word to go and these times will be added and divided by the number of contestants submitting estimates and the result will be the figures nearest which will lie the prizes. Secret checking stations will be established to prevent speeding in some parts of the course and loafing in others.

The entry list up to last Saturday night is as follows:

No.	Car	Entrant	Driver
1	Baker	Reamer & Haines	H. H. Kirkpatrick
2	Baker	Reamer & Haines	C. A. Haines
3	Babcock	F. W. Eveland	John B. Hill
4	Babcock	F. W. Eveland	Miss E. M. Cuddy
5	Detroit Electric	Thos. F. Grugan	Thomas F. Grugan
6	Woods Electric	Mrs. T. F. Simmons	Mrs. Thos. F. Simmons
7	Studebaker	Studebaker Auto. Co.	J. W. MacMullin
8	Columbus Electric	Columbus Buggy Co.	H. F. W. Rasmussen
9	Clark Electric	A. F. Clark	A. F. Clark
10	Detroit Electric	J. C. Parker & Son Co.	R. L. Heberling
11	Detroit Electric	Anderson Carriage Co.	W. Reese Parker
12	Detroit Electric	H. E. C. Nennich	John Geiss
13	Woods Electric	Miss A. M. Kelly	W. H. Metcalf
14	Woods Electric	J. C. Bartlett	J. C. Bartlett
15	Woods Electric	Woods Elec. Garage	Arnold Neirring
16	Waverley Roadster	Waverley Electric Co.	George A. Fort
17	Waver'y Runabout	F. B. Rutherford	F. B. Rutherford
18	Waverley Roadster	T. Munroe Dobbins,	Emlen S. Hare
19	Detroit Electric	G. Heide Norris	C. B. Hoffer
20	Waverley Victoria	Mrs. C. M. Campbell	Mrs. C. M. Campbell
21	Detroit Electric	Lincoln K. Passmore	J. Allan Passmore
22	Woods Elec. Vict'a	Woods Elec. Garage	Leonard H. Worne
23	Detroit Electric	Wm. H. Horstmann	William H. Horstmann
24	Detroit Electric	Dr. Mary W. Griscom	Dr. Mary W. Griscom
25	Studebaker	Miss M. E. Morrison	Miss M. E. Morrison
26	Woods Electric	Dr. A. A. Apple	Dr. A. A. Apple
27	Detroit Electric	Abram C. Mott	R. T. Alford
28	Rauch and Lang	Gen. Motor Car Co.	S. S. Crawford
29	Woods Electric	Dr. E. B. Fanning	Dr. E. B. Fanning
30	Waverley	Waverley Electric Co.	Harry Peyton
31	Waverley	Waverley Electric Co.	Mrs. George A. Fort

Steel Bronze

So-called Manganese Bronze Is Devoid of This Element

MANGANESE, used in the melting down of the charge that enters into "steel-bronze," is eliminated in the furnace, but it does perform a valuable service since it distributes the iron content, preventing the same from forming into "shot" and rendering the metal unfit for its intended service. But when manganese is used the shot formation is aborted and the good steel-bronze resulting has physical properties as follows:

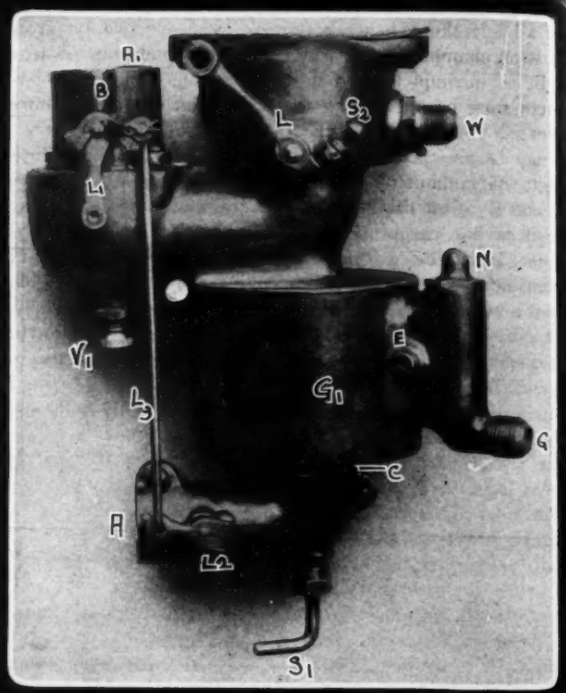
Physical Properties	
Tensile strength in pounds per square inch	71,000
Elastic limit in pounds per square inch	38,190
Elongation per cent. in two inches	31
Reduction of area in per cent	30.4
Diameter of test proof in inches	2
Distance in inches between enlargements of test proof	1

Note.—The above is an average test of Parsons manganese bronze which was taken from the propeller hub of Monitor No. 7, U. S. N. Manganese bronze, so-called, is used quite extensively in automobile work. An example of an excellent application will be found in the crankcase construction of "Locomobiles"; they are of this metal.

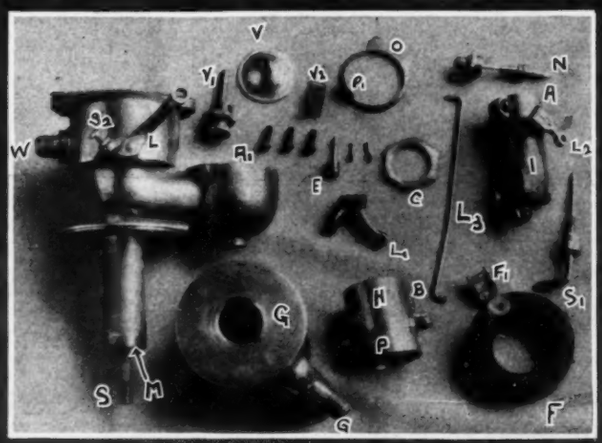
Mayer Carbureter

IN order to obtain a good understanding of the general appearance of the Mayer type of carbureter, reference may be had to Figs. 1, 2 and 3 of the respective sides of the carbureter and the same dissembled. The performance in service will depend as in carbureter work in general upon the harmony of relation of the carbureter itself to the motor to which it is applied, not forgetting that even the muffler may detract from the performance of the motor and effect the good working of the carbureter. In trying to arrive at a conservative conclusion of the good that resides in a carbureter the path is beset with difficulties, the magnitude of which can only be arrived at if the whole equipment is subjected to an exhaustive test, so that the service as rendered by the caurbureter will be gauged in the light of the handicaps under which it works.

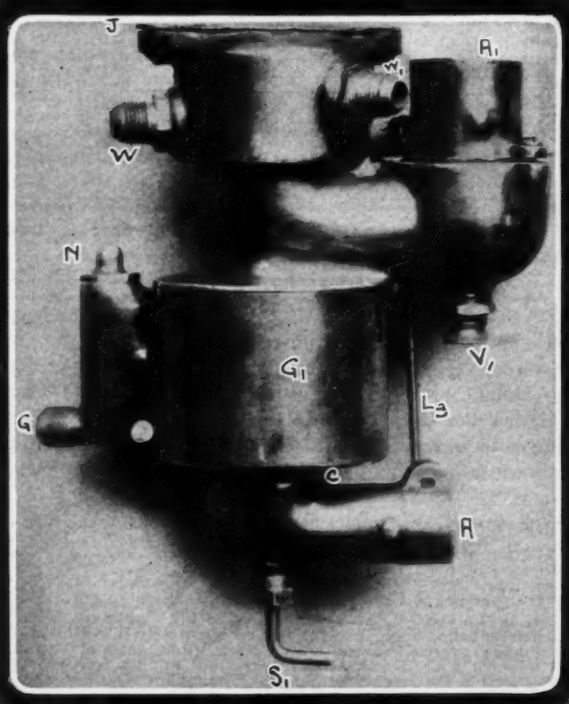
The accompanying tests were made on a six-cylinder motor under conditions of back pressure due to the muffler used, of a strangling power to diminish the power of the motor to a quite noticeable extent, especially at the higher speeds at which power is given. The back pressure was 1 pound per square inch at 500 revolutions per minute of the motor, gradually increasing to 6.75 pounds per square inch at 1,500 revolutions per minute. This does not seem to be a large back pressure, but it is, nevertheless, due to the fact that it is a large proportion of the mean effective pressure, the latter being approximately 70 to 75 pounds per square inch in the motor cylinders and the ratio of back pressure to mean effective pressure under these conditions is not far from 12. In other words, this



A—Regular air intake. A1—Supplementary air intake. L—Throttle lever. L, L1, L2—Levers for closing air for starting. V1—Air valve adjustment. B—Ball to hold lever L1 open or closed. G1—Float chamber. E—Float pivot pin. N—Needle valve. G—Gasoline inlet. C—Locking nut. S1—Jet adjustment. W—Water inlet. S2—Set screw for throttle adjustment



A—Air intake. A1—Supplementary air intake. N—Needle valve. L—Throttle lever. L1, L2, L3—Levers for closing air ports for starting. F—Cork float. F1—Float lever. E—Float pivot pin. C—Locking nut for float chamber. W—Water inlet. S—Jet. M—Air intake. G—Float chamber. V1—Extra air inlet adjustment. V—Extra air valve. V2—Extra air valve spring. O—Fixed supplementary air sleeve. P—Fixed supplementary air port. P1—Fixed supplementary air control cover. H—Supplementary air tube.



A—Air intake. A1—Supplementary air. J—Gasket point. W1—Ware outlet. W—Water inlet. V1—Air valve adjustment. G1—Float chamber. G—Gasoline inlet. N—Needle valve. L3—Lever for closing air for starting. C—Locking nut. S1—Jet adjustment.

back pressure has a magnitude of substantially 1-12 of the mean effective pressure and it means that approximately 1-12 of the power of the motor is thwarted, due to back pressure. But this is not all. If the exhaust is impeded in its migration from the combustion chamber to the atmosphere the conditions of scavenging will be incomplete, and it is but a step from a state of incomplete state of scavenging to a condition of poor carburetion. The reason for this lies in the fact that however good the mixture may be as it comes from the carbureter if it is diluted by products of combustion it will fall below its normal level of value and the first thing that the average automobilist does is to blame it on the carbureter, forgetting the while that the gas as it comes from the carbureter is poisoned by the products of combustion that are kept from leaving the combustion chamber because a poor muffler serves as a cork, so to say.

The motor that was used in this test was of the six-cylinder, water-cooled, four-cycle type with a bore of 4 1-2 inches and a stroke of 5 1-2 inches. The motor had been run on the block for a sufficiently long time to reduce friction; it was then delivered to a well-equipped laboratory and tested out in conjunction with the testing of the carbureter as here referred to. The timing of the motor was as follows:

Exhaust valves open 40 degrees before center.

Exhaust valves closed 5 degrees after center.

Inlet valves open 7 degrees and 50 minutes after center.

Inlet valves closed 30 degrees after center.

Ignition was accomplished by a magneto with a maximum brake of 5 7-16 inches as measured on the circumference of the flywheel and during operation a mercury manometer was attached 1 foot from the end of the exhaust manifold with the result as follows:

R.P.M.	Brake Pull	H.P.	One Side HG Inches	Lbs. per sq. in. Back Pressure
400	75	71.1	1	.98
500	73	20.8	1½	1.48
600	73	25.0	2	1.96
700	71	28.4	2¼	2.2
800	69	31.5	2¾	2.7
900	65	33.4	3¼	3.2
1,000	62	35.4	3⅝	3.35
1,100	57	35.7	4¼	4.16
1,200	52	35.7	5	4.9
1,300	50	37.0	5½	5.4
1,400	43	34.4	6	5.88
1,500	42	36.0	6¾	6.6

The conclusions to be drawn are:

(*a*) The most favorable position for the break of the magneto is 6 7-8 inches on the circumference of the flywheel.

(*b*) That the valve timing within wide limits has a negligible effect on the maximum power.

(*c*) That the Mayer Model M carbureter gives the maximum power.

(*d*) That the aggregate power lost in driving the water pump, oiler and the interrupter is too small to be measured on the laboratory dynamometer.

(*e*) That to develop the maximum power the muffler must be taken entirely off as the cut-out does not afford a sufficiently clear passage for the exhaust.

(*f*) That the back pressure in the muffler is excessive, being a maximum of 6 1-3 pounds.

(*g*) That the compression is altogether too high (19 per cent.). The clearance volumes vary from 19 to 24 per cent. in different motors.

(*h*) That it appears possible by taking special care in the construction of the motor and having all the clearance volumes exactly the same (about 23 per cent.) and by devoting attention to the carbureter and the inlet manifold to secure an intimate mixture of fuel and air and a perfect charge distribution to boost the maximum horsepower up to 60.

Under the conditions as above indicated, including the conclusions drawn by the tester, the results obtained from the Mayer carbureter were uniformly good and as determined by tests, of which results are here given, that the performance under speed-changing conditions are thoroughly good, particularly if the proper size of carbureter is selected, taking into account the characteristic of the motor, remembering that what will do in one case may not do so good in another.

MAYER MODEL M CARBURETER

R.P.M.	Brake Pull	H.P.
400	72	16.5
500	71	20.2
600	70	24.0
1,300	64	47.5
1,400	64	51.2
1,500	59	50.6

1 1-4-INCH MAYER WITH AIR INTAKE OFF AND VALVE OUT

R.P.M.	Brake Pull	H.P.
400	74	16.9
500	72	20.5
600	70	28.0
1,300	62	46.0
1,400	58	46.1
1,500	57	48.7

1 3-4-INCH MAYER, MODEL M, WITH REGULAR OPEN MANIFOLD

R.P.M.	Brake Pull	H.P.
1,200	61	42.0
1,300	60	44.50
1,400	57	45.6
1,500	55	47.0

CHECKED RUN

R.P.M.	Brake Pull	H.P.
400	77.0	17.6
500	78.0	22.3
600	75.5	26.2
700	72.5	29.0
800	74.0	33.8
900	69.0	35.5
1,000	68.0	38.8
1,100	67.5	42.5
1,200	65.0	44.5
1,300	64.0	47.5
1,400	61.0	48.8
1,500	56.0	47.9
1,600	55.0	50.4

Five runs were made with a 1 1-4-inch carbureter and the most consistent chosen throughout the range. The carbureter was adjusted and was not touched throughout complete test run from 600 to 2,000 revolutions per minute.

Speed	Brake load gross	Brake load net	B.H.P.
600	51	24	14.4
700	52.5	25.5	17.8
800	52	25	20
900	52	25	22.5
1000	51.75	24.75	24.75
1100	51.5	24.5	26.9
1200	50.5	23.5	28.2
1300	49.75	22.75	29.5
1400	48.75	21.75	30.4
1500	47.75	20.75	31.1
1600	47.125	20.125	32.1
1700	46.5	19.5	33.2
1800	45.5	18.5	33.4
1900	44	17.0	32.3
2000	43.5	16.5	33.0

M. A. M. Elects 2-Dozen

Membership Growing Rapidly; Importance of Close Association Being Recognized

TWENTY-FOUR new members elected to the Motor and Accessory Manufacturers at a recent meeting of that organization. This brings the total roster of the association up to 200 members.

The names of those just chosen are as follows: Apple Electric Company, Borne-Scrymser Company, Carpenter Steel Company, Chicago Telephone Supply Company, Covert Motor Vehicle Company, Crucible Steel Company of America, Dover Stamping & Manufacturing Company, Eisemann Magneto Company, The Ferro Machine & Foundry Company, Frost Gear & Machine Company, Isaac G. Johnson & Company, The Kellogg Manufacturing Company, The Miller Rubber Company, Newark Rivet Works, Reichenbach Laboratories Company, Russel Motor Axle Company, A. Schrader's Son, Inc., The F. W. Spacke Machine Company, Standard Thermometer Company, The Stein Double Cushion Tire Company, Stevens Manufacturing Company, The White & Bagley Company, The Willard Storage Battery Company, and O. W. Young.

Demountable Solid Tires

Torrilhon, in France, Makes Demountable Solid Tire Application

AFTER demountable rims in connection with pneumatic tires have become a common appliance, the French firm of Torrilhon has sought to give the same convenience to commercial vehicles employing solid-rubber tires. The demountable rim carrying the rubber bandage has a series of oblong steel studs on its inner face. The fixed rim carries two circular grooves cut at intervals to receive the studs on the dismountable rim. The central rib dividing the two grooves on the fixed rim is a little shorter at one end of each of its sections than the two others. Thus when the demountable rim is placed in position it is given a slight circular movement to bring the studs in a locked position between the two outer ribs, effectively preventing all lateral motion. In each of the spaces left free after the rim has been placed in position is slipped a steel key, the inner extremity of which is provided with a heel received in a depression provided for it on the face of the fixed rim. A nut is screwed onto the outer end of the key and secured by a split pin. The wheel has been supplied by the Torrilhon company for some of the omnibuses in service in Paris.

French Economy Results

Fuel and Lubricating Oil Determinations of the French Military Trials

COMPLETE official figures on fuel and lubricating oil consumption in connection with the French military trials have just been issued by the Automobile Club of France. Unlike last year's event the trials were not really a competition, there being no classification according to merit, and all being capable of finishing in the winning class. It was necessary to fulfill the army requirements for regularity and economy, but no opportunity is given of differentiating between the best and the worst of the vehicles fulfilling those requirements. Thus, although the same firms were represented and the vehicles had undergone little change, it is not possible to make close comparisons with the results obtained a year ago.

The event was a regularity and fuel economy test over a distance of 1,570 miles, the fuels used being gasoline, benzol and alcohol. At the head of the following table will be found the two vehicles which, in their respective classes, proved to be the most efficient last year. It is interesting to note that the average distance covered on a gallon of lubricating oil by the sixteen successful vehicles is 142 miles. The explanation of the high oil consumption of certain trucks, particularly the Panhard, is that last year two vehicles were put out of business through stinting of oil, with a desire to figure well on the economy test. This year the drivers took no chances, especially as there was nothing to be gained by ultra economy.

The vehicles averaged 9.7 miles to the gallon of gasoline, 10.4 to benzol, and only 8.2 on carburetted alcohol. In making comparisons it should be remembered that no important changes could be effected on the carbureters to suit the different fuels. It was impossible to change the jet, regulate the air, the amount of heat, or the weight of the float, but it was not possible to substitute a different carbureter for each fuel. The trials were held in satisfactory weather, and generally over good roads.

Fuel Consumption of 16 Successful Trucks in French Military Trials

	Total Weight, pounds	Useful Load, pounds	Lubricating Oil 1570 Miles: Total in Gallons	Lubricating Oil 1570 Miles: Miles per Gallon	Gasoline 560 Miles: Average Speed m.p.h.	Gasoline 560 Miles: Total Gallons	Gasoline 560 Miles: Miles per Gallon	Benzol 560 Miles: Average Speed m.p.h.	Benzol 560 Miles: Total Gallons	Benzol 560 Miles: Miles per Gallon	Carburetted Alcohol 450 Miles: Average Speed m.p.h.	Carburetted Alcohol 450 Miles: Total Gallons	Carburetted Alcohol 450 Miles: Miles per Gallon
*Saurer	12,658	5796	....	368	14.6	....	9.4	....	....	10.8	....	....	8.1
*Delahaye	14,524	7896	....	194	11.0	....	11.1	....	....	11.15	....	....	10.5
DeDion Bouton	13,299	8427	6.2	254	9.5	49.5	11.3	9.8	47.9	11.7	9.6	49.0	9.2
DeDion Bouton	13,161	7444	4.9	320	9.5	54.5	10.3	9.8	50.0	11.4	9.7	49.0	9.2
Peugeot	13,106	7903	8.8	178	10.4	54.5	10.3	9.5	53.0	10.6	10.4	54.3	8.3
Peugeot	13,346	8143	8.8	178	10.4	55.1	10.1	9.5	50.8	11.0	10.5	53.0	8.5
Delahaye	13,855	8593	7.5	209	8.6	63.0	8 9	8.2	65.0	8.6	7.7	62.4	7.2
Delahaye	13,822	8553	8.8	178	8.6	68.8	8.2	8.2	67.0	8.4	7.8	69.2	6 5
Panhard-Levassor	12,323	7609	15.0	145	9.6	49.8	11.2	9.5	51.0	10.9	9.8	49.4	9.1
Panhard-Levassor	12,336	7640	18.5	85	9.7	50.4	11.1	9.5	49.6	11.3	9.8	50 5	8.9
Panhard-Levassor	13,653	8703	19.8	79	9.8	56.1	10.0	9.8	58.3	9.6	10.2	51.2	8.8
Panhard-Levassor	13,564	8670	16.3	96	9.7	54.5	10.3	9.9	55.5	10.1	10.2	56.2	8.1
Berliet	11,827	7465	7.5	209	8.5	62.6	9.0	8.8	59.4	9.5	8.5	63.8	7.1
Berliet	11,838	7473	7.5	209	8.5	63.5	8.8	8.8	53.6	10.4	8.5	58.2	7.6
Berliet	14,651	9801	14.3	110	8.3	75.2	7.5	8.5	54.0	10.4	8.3	55.8	8.0
Berliet	14,631	9781	15.6	100	8.2	76.5	7.3	8.5	56.3	10.0	8.3	70.6	6.4
Vinot-Deguingand	10,987	6864	5.9	266	9.8	45.5	12.3	9.5	44.4	12.6	9.8	41.8	10.7
Vinot-Deguingand	10,832	6710	9.7	162	9.8	46.4	12 1	9.7	46.0	12.2	10.3	45.4	9

*1909 Winner.
Useful load includes weight of body.

Use of Benzol Abroad.—The growing use of benzol as a fuel for motors in France, checks the demand for gasoline and should redound to the advantage of American automobilists. The fact remains that benzol is a good prospect for American consumption.

Fig. 1—Wheel complete, with the two solid tires in place

Fig. 2—Wheel with one tire in place and the space for the other showing

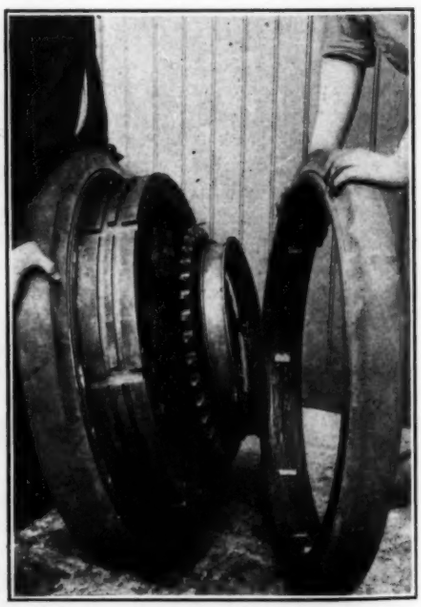


Fig. 3—Wheel with one tire in place and the other being put on

Bergdoll "30" for 1911

NINE DISTINCT BODY DESIGNS ARE INCLUDED, THE IDENTICAL CHASSIS SHOWING MANY FINE POINTS OF DESIGN

THE Louis J. Bergdoll Motor Company, of Philadelphia, is making its real debut in motor car manufacture. The Bergdoll "30," which is making its 1911 bow to the public, is the result of two years' experimental work, and embodies in a popular-priced car all the practical features and advantages of the best foreign and domestic development. Fifty-odd taxicabs that were turned out by the company last year have been run an average of 8000 miles. The company gives a broad guaranty of material and workmanship with every car turned out of its well-equipped factory.

Bergdoll bodies are constructed on the popular straight-line style. The standard finish is in Richelieu blue with pin striping of turquoise. The running gear is done in primrose yellow and the upholstery and fittings are of adequate style and construction. A special feature of the car is the extra provision that is made to insure plenty of leg-room, the long body lending itself to this phase.

The most important mechanical factors in the Bergdoll "30" may be described briefly as follows: The motor has four cylinders of reverberatory air-furnace iron, cast en bloc to secure lightness, compactness and satisfactory water-jacketing. The cylinders are 4 by 4 1-2 inches, thus indicating horsepower of 25.60. The intake valves are of large size and are located in the heads of the cylinders with exhausts at the sides. The crankshaft is of nickel-steel, heat-treated and tested to five times the stress of usual service conditions. The connecting rods are drop forged with long bearings of Parsons white bronze, with sheet-metal liners for taking up wear.

Throughout the motor, transmission and running gear, large annular ball bearings are used and in following out this idea of big bearings in the construction of the Bergdoll, the fact may be noted that at each end of the crankshaft bearings of greater size than those usually recommended by manufacturers are to be found.

The system of lubrication is automatic, maintaining a constant level for splashing oil in the crank chamber, with an overflow into a reservoir below. A continuous supply of oil is carried to the engine base by a pump operated by camshaft. An ingenious partition in the engine base prevents excess oil at either end while traversing a grade. One filling is said to be sufficient for 300 miles. The supplementary system includes oil and grease cups throughout the chassis where required.

The carbureter is automatic and practically fool-proof. It is of the single-jet type with auxiliary air inlet, needle valve and air valve being adjusted to insure a mixture for the varying speeds. Warm water from the circulation passes around the mixing chamber. Strained gasoline is carried to the carbureter through a seamless copper tube.

The crankcase is of cast aluminum, the upper half of which contains the cylinders, crankshaft bearings, oil pump, magneto, water pump and unisparker. The lower half forms the oil reservoir.

The clutch is of the multiple disc type and the transmission, which is selective, gives three speeds forward and reverse. The circulatory system is founded upon a centrifugal pump, which passes the water through the cylinder jackets to the Livingston radiator of cellular type.

Worm-and-gear with ball-thrust bearings is the style of the steering gear. The column is of wide diameter, with control levers on top of a 17-inch wheel. One advantage claimed for this type is that a quarter rotation of the mechanism will bring a new section of the gear into action, thus increasing the life of the whole steering system.

Guaranteed springs are rather novel in motor car construction, but the Bergdoll company specifically covers this element of the car. The springs are of chrome-vanadium steel, semi-elliptical in front and three-quarter elliptical in the rear, which are said to secure easy riding and durability.

The axles of the Bergdoll are somewhat out of the ordinary. The front axle is an I-beam section in one piece, heat-treated, drop-forged with two large annular bearings at each spindle. The entire weight at this point is carried on a ball three-quarters of an inch in diameter, placed at the top of the vertical column of the knuckle.

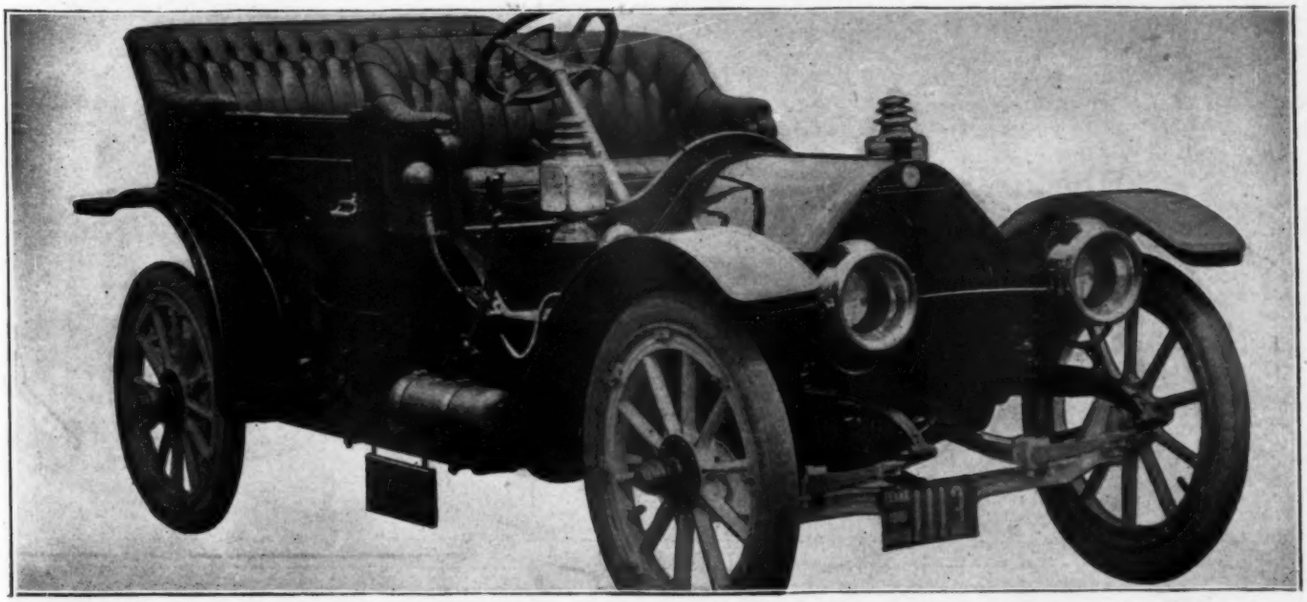


Fig. 1—The Bergdoll "Thirty" touring car, possessing fine lines and built for comfort

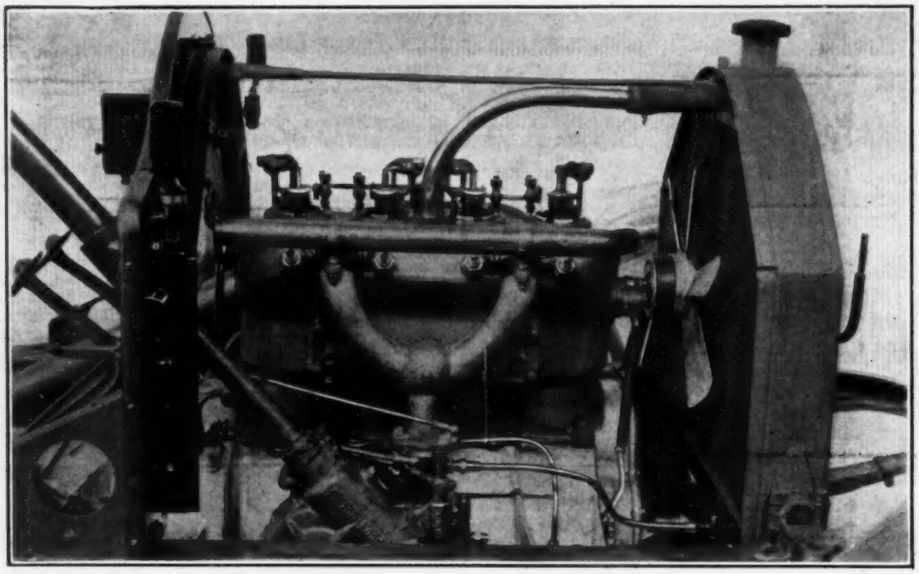


Fig. 2—Showing the inlet side of the Bergdoll "Thirty" Motor

Fig. 3—Illustrating the mechanism

The rear axle is of full-floating type, with a housing of pressed steel in a single piece the entire length of the axle. A large cover over the rear part of the housing allows easy inspection of the pinion shaft and gear, differential and bevel gears and other mechanical parts. The shafts and gears of various kinds are made of 3 1-2 per cent. nickel-steel, appropriately heat-treated. Ten large annular ball bearings and three thrust bearings are used in this axle. The gear ratio is 3 11-14 to 1.

Cold-pressed steel, twenty to thirty point carbon, is the material from which the frame is made. The foot brake is located on the driving shaft behind the transmission. It is of the contracting type, with 3-inch face band, lined with Thermoid. The emergency brake is internal expending and self-equalizing. Both brakes are double-acting.

The car is equipped with artillery wheels, 34 inches in diameter. The hubs and brake-drums are bolted to the alternate spokes of the rear wheels. Continental tires and Continental quick detachable and demountable rims are used on all Bergdoll cars.

Ignition is by two systems. The new Atwater-Kent uni-

SPECIFICATIONS FOR BERGDOLL

MODELS	Price	H.P.A.L.A.M.	BODY		MOTOR				COOLING		IGNITION		Lubrication
			Type	Seats	Cyl.	Bore	Stroke	Cyl. Cast	Radiator	Pump	Magneto	Battery	
Bergdoll "30"	$1500	25.6	Tour'g.	5	4	4	4½	Block.	Cellular.	Cent'fl.	At.-Kent	Dry	Splash.
Bergdoll "30"	1500	25.6	R'ster.	3	4	4	4½	Block.	Cellular.	Cent'fl.	At.-Kent	Dry	Splash.
Bergdoll "30"	1600	25.6	T. Ton.	4	4	4	4½	Block.	Cellular.	Cent'fl.	At.-Kent	Dry	Splash.
Bergdoll "30"	1600	25.6	Fd. Tg.	5	4	4	4½	Block.	Cellular.	Cent'fl.	At.-Kent	Dry	Splash.
Bergdoll "30"	2000	25.6	Taxi.	4	4	4	4½	Block.	Cellular.	Cent'fl.	At.-Kent	Dry	Splash.
Bergdoll "30"	2000	25.6	Coupé.	2	4	4	4½	Block.	Cellular.	Cent'fl.	At.-Kent	Dry	Splash.
Bergdoll "30"	2500	25.6	Col. cp.	3	4	4	4½	Block.	Cellular.	Cent'fl.	At.-Kent	Dry	Splash.
Bergdoll "30"	2500	25.6	Limous.	5	4	4	4½	Block.	Cellular.	Cent'fl.	At.-Kent	Dry	Splash.
Bergdoll "30"	2600	25.6	Land't.	5	4	4	4½	Block.	Cellular.	Cent'fl.	At.-Kent	Dry	Splash.

*Weight of

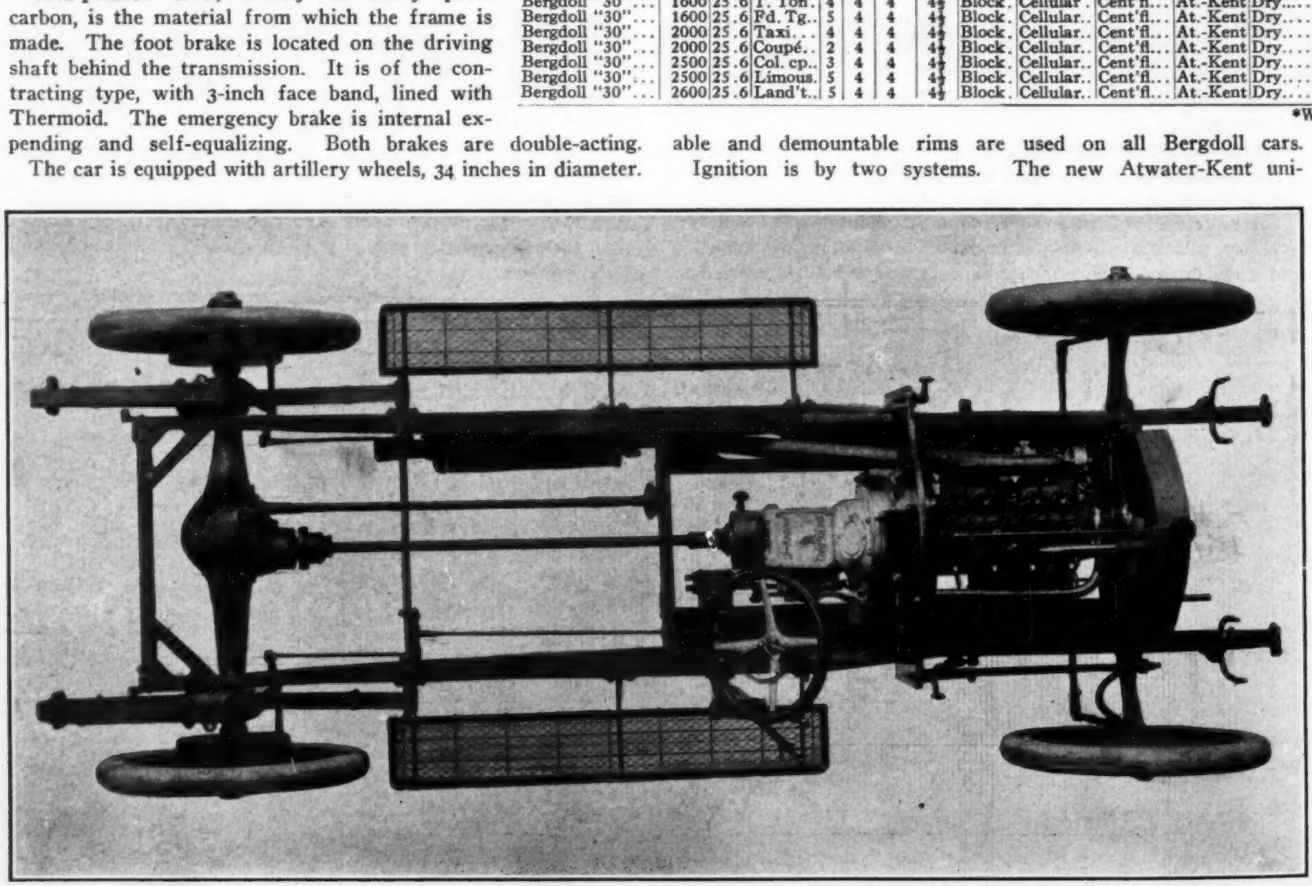


Fig. 4—Looking down upon the chassis; simplicity and compactness are evident

of the Bergdoll clutch

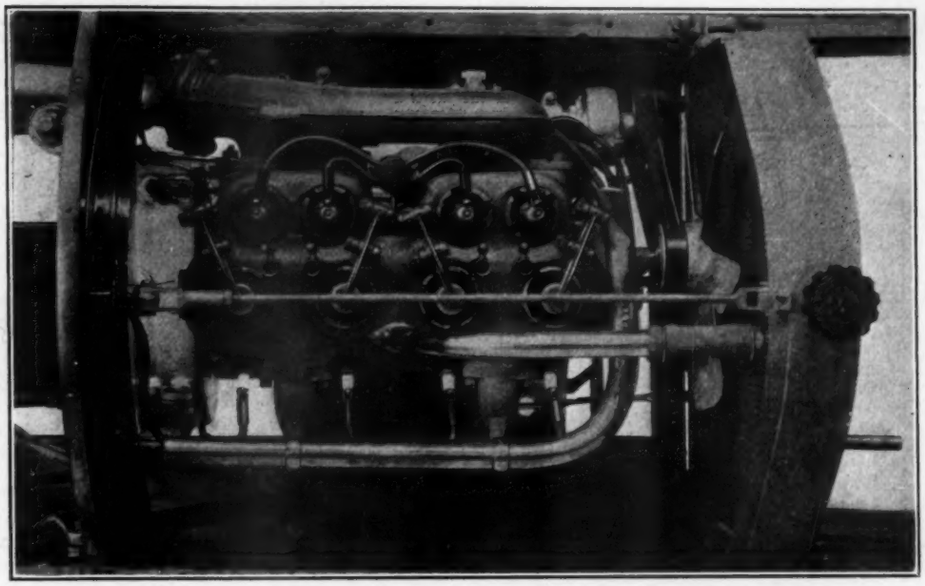


Fig. 5—Showing the top of the motor, disclosing its valves and spark plugs

sparker with coil and batteries is supplied as the regular equipment, and Bosch magneto and an independent set of spark plugs are furnished as special equipment. Both systems are high tension. In the uni-sparker insulated wires carried in tubes along the top of the motor connect the device with the spark plugs. The magneto wires are laid through vertical brass tubes.

Continental quick detachable, demountable rims; Continental tires; Livingston cellular radiator; Schwartz artillery wheels, the double ignition system; Gray and Davis lamps and the compact rear axle construction are some of the points emphasized by the makers of the Bergdoll, in introducing the car, and steel alloys are used in the parts subjected to greatest strain.

The factory of the company is located at Thirty-first and Dauphin streets and has a floor space of 115,000 square feet. The painting and finishing departments are downtown.

The officers of the company are as follows: Louis J. Bergdoll, president; E. C. Johnson, vice-president; William E. Haupt, second vice-president; Charles A. Bergdoll, treasurer; Philip S. Malickson, secretary.

CARS AS OFFERED FOR 1911

Clutch	TRANSMISSION				Wheelbase	Tread	Frame	BEARINGS			Weight	TIRES	
	Type	Speeds	Location	Drive				Crankshaft	Transmis'n	Axle		Front	Rear
M'l. disc.	Selecti'e.	3	S-frame	Shaft...	115	56	Chan. st.	Ball....	Ball....	Ball....	1450*	34x3½	34x3½
M'l. disc.	Selecti'e.	3	S-frame	Shaft...	115	56	Chan. st.	Ball....	Ball....	Ball....	1450*	34x3½	34x3½
M'l. disc.	Selecti'e.	3	S-frame	Shaft...	115	56	Chan. st.	Ball....	Ball....	Ball....	1450*	34x3½	34x3½
M'l. disc.	Selecti'e.	3	S-frame	Shaft...	115	56	Chan. st.	Ball....	Ball....	Ball....	1450*	34x3½	34x3½
M'l. disc.	Selecti'e.	3	S-frame	Shaft...	115	56	Chan. st.	Ball....	Ball....	Ball....	1450*	34x4	34x4
M'l. disc.	Selecti'e.	3	S-frame	Shaft..	115	56	Chan. st.	Ball....	Ball....	Ball....	1450*	34x3½	34x3½
M'l. disc.	Selecti'e.	3	S-frame	Shaft...	115	56	Chan. st.	Ball....	Ball....	Ball....	1450*	34x3½	34x3½
M'l. disc.	Selecti'e.	3	S-frame	Shaft...	115	56	Chan. st.	Ball....	Ball....	Ball....	1450*	34x4	34x4
M'l. disc.	Selecti'e.	3	S-frame	Shaft...	115	56	Chan. st.	Ball....	Ball....	Ball....	1450*	34x4	34x4

chassis.

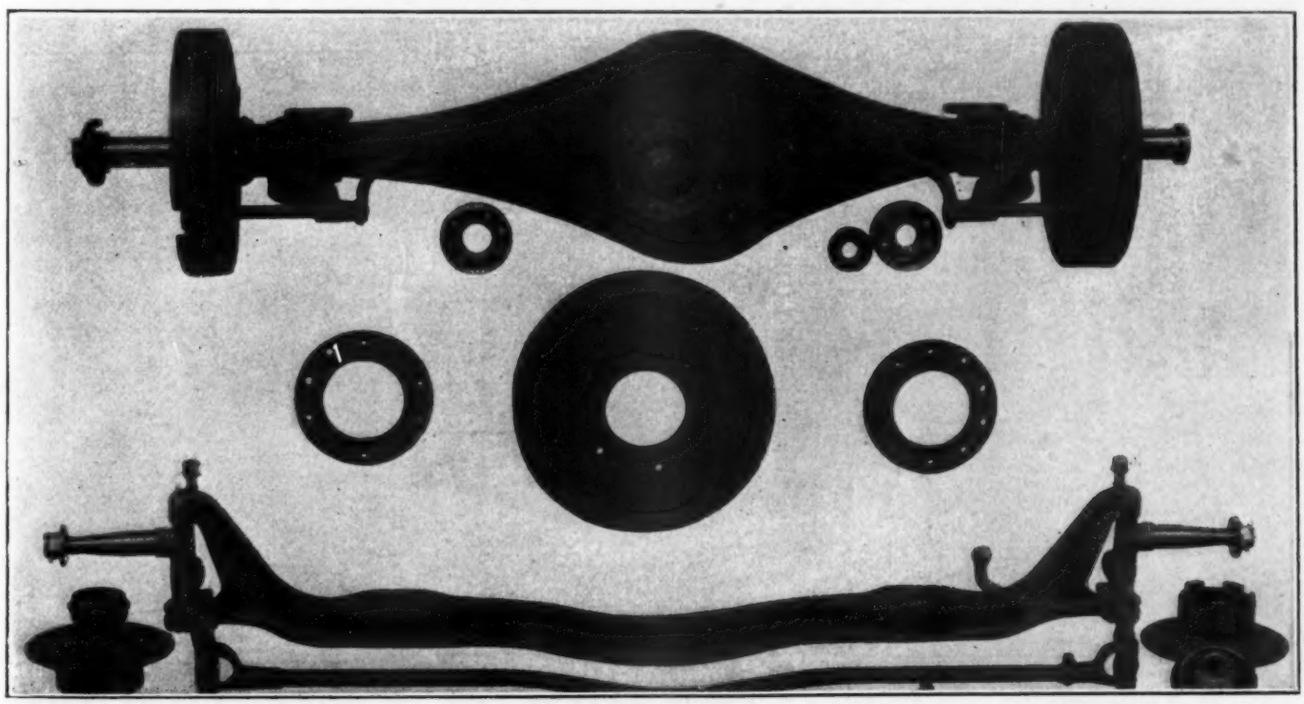


Fig. 6—Assemblage of the front and rear axles of the Bergdoll "Thirty"

Delco Ignition System

SHOWING THE UNITS OF THE IGNITION SYSTEM; ILLUSTRATING ITS APPLICATION ON A CADILLAC MOTOR AND DESCRIBING ITS WORKINGS

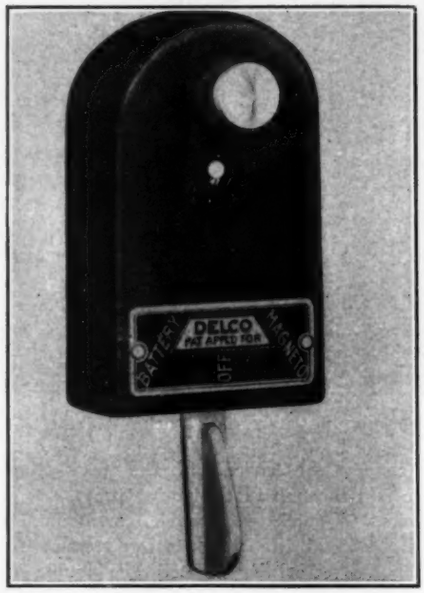


Fig. 1—Delco switch equipped with a mechanical lock and with easy-starting device

REFERRING to the illustrations, Fig. 1 is the dashboard switch which provides a means for throwing in either the battery or magneto, and a neutral position for opening the ignition circuit. Fig. 2 presents the scheme of installation of this system as it applies to a Cadillac motor, in which the details of the relay are shown in Fig. 3, and those of the distributor are plainly set forth in Fig. 4. Fig. 5 shows the distributing coil.

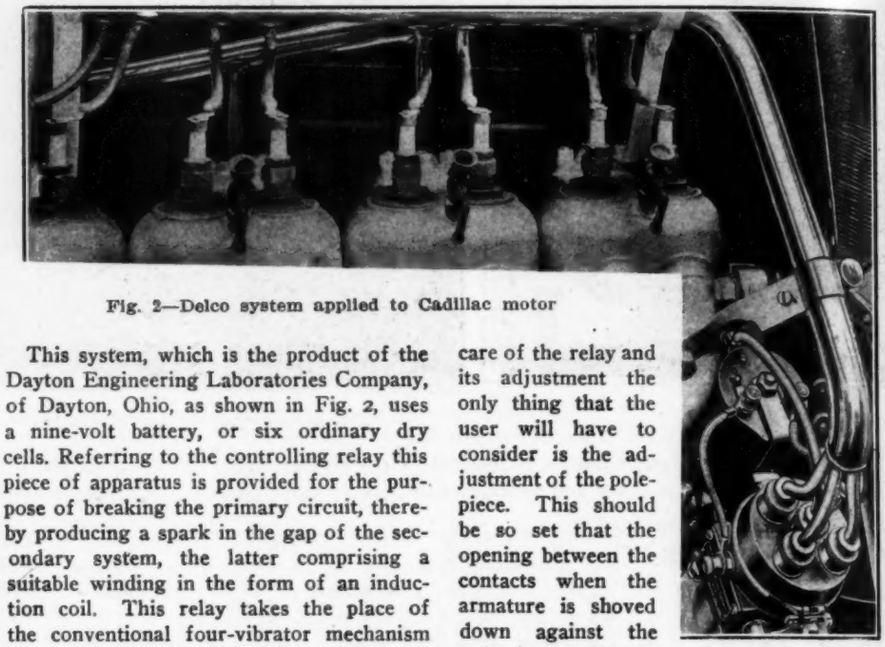


Fig. 2—Delco system applied to Cadillac motor

This system, which is the product of the Dayton Engineering Laboratories Company, of Dayton, Ohio, as shown in Fig. 2, uses a nine-volt battery, or six ordinary dry cells. Referring to the controlling relay this piece of apparatus is provided for the purpose of breaking the primary circuit, thereby producing a spark in the gap of the secondary system, the latter comprising a suitable winding in the form of an induction coil. This relay takes the place of the conventional four-vibrator mechanism as employed in the standard multi-coil systems, and its proper function is that as ordinarily performed by a master vibrator. The difference between this controlling relay and the regular form of master vibrator lies in the fact that with the master vibrator there are a series of sparks, whereas in the controlling relay there is but one spark for each contact of the commutator. In this system there are no moving parts excepting in connection with the relays, and it is pointed out by the maker that in the care of the relay and its adjustment the only thing that the user will have to consider is the adjustment of the pole-piece. This should be so set that the opening between the contacts when the armature is shoved down against the pole-piece will be equal to about the thickness of one sheet of book paper, a matter of perhaps 0.006 inch. A simple way of fixing upon this necessary adjustment is to screw the pole-piece outward, that is, in the direction opposite to the hands of a clock until the motor stops firing, then go the other way four or five notches.

A condenser is used just as in other systems, it being located in a protected position, requiring no care.

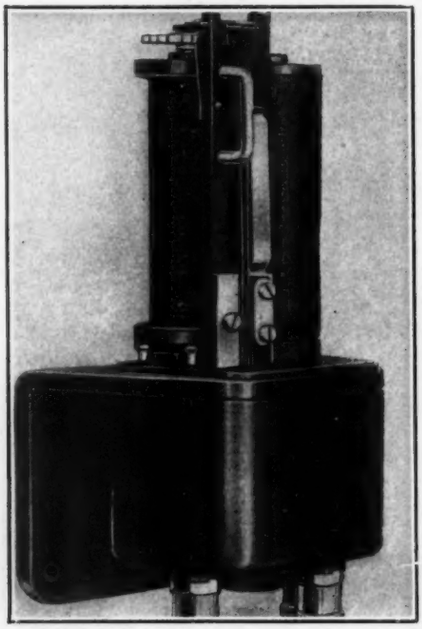


Fig. 3—Delco relay or circuit breaker with cover removed

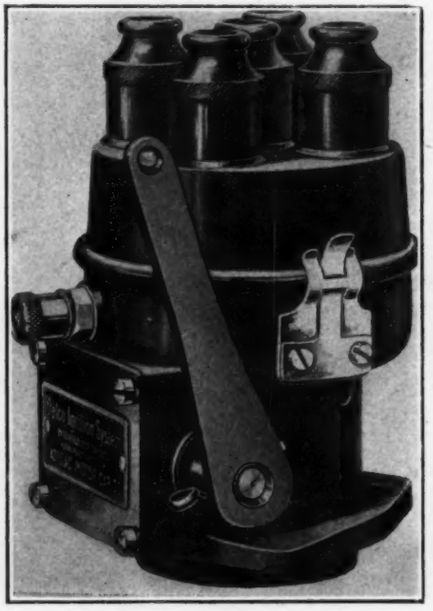


Fig. 4—Delco high-tension distributor; waterproof; no moving wires

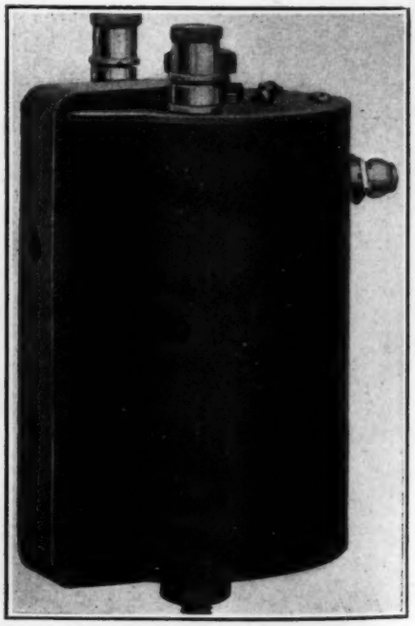


Fig. 5—Distributing coil with the cover removed